5 MAY 1960

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for economy in **Oil-filled cables**

Here is BICC's latest development in 33kV power transmission—the Ductless, Shaped-Conductor, Oil-filled Cable. Dispensing with fillers and built-in ducts, this new design is essentially one of economy in materials, resulting in reduced cable costs. A full range of joints and terminations has been specially designed by BICC for use with this cable.

D.S.O. Cables can be supplied with aluminium sheaths or reinforced lead sheaths and copper or aluminium conductors. Frequently the all-aluminium D.S.O. Cable (aluminium conductors and aluminium sheath) offers the most economical design.

BICC

DUCTLESS SHAPED-CONDUCTOR OIL-FILLED

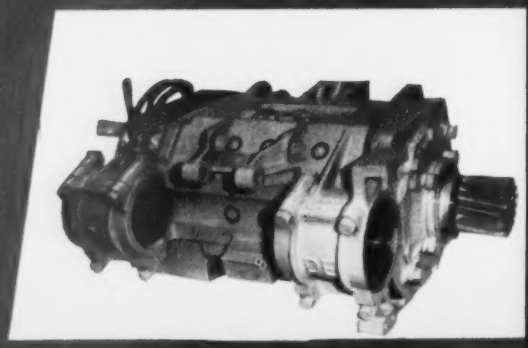
DSO

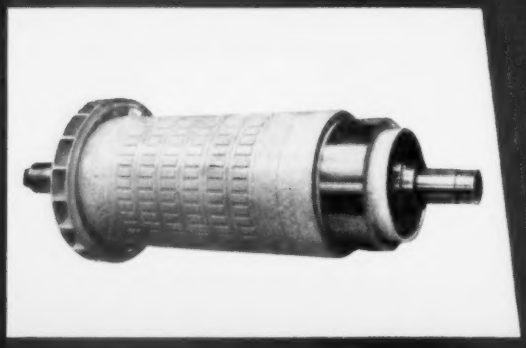
33kV CABLES

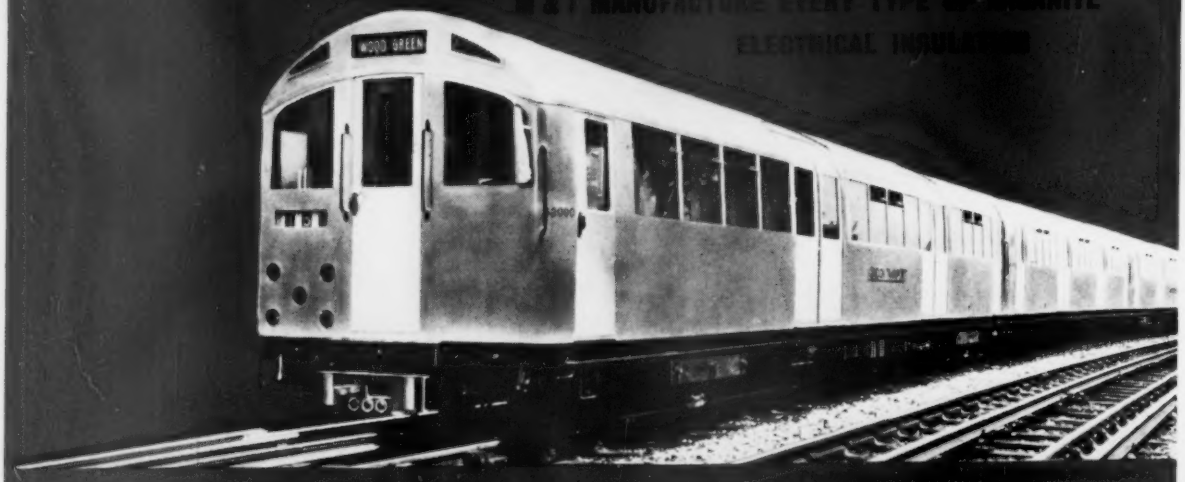
Further information on D.S.O. Cables is contained in Publication No. 392—available on request.

BRITISH INSULATED CALLENDER'S CABLES LIMITED · 21 BLOOMSBURY STREET · LONDON · WC1

M & I V-Rings and Commutator Segment Separators for Traction Motors driving the new London Tube Trains







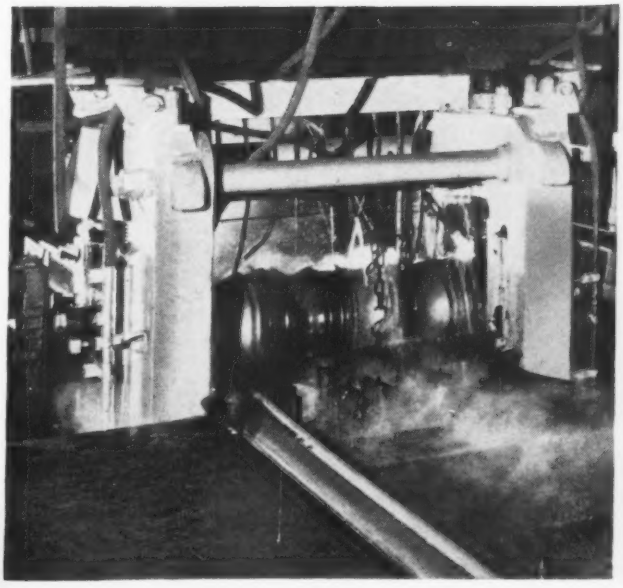
m and i the electrical insulation people

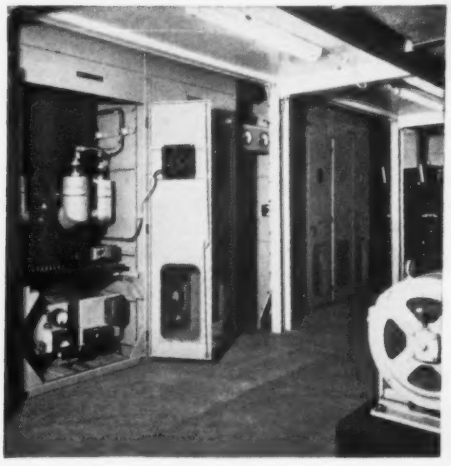
Britain's First

converter-fed

hot reversing mill

The first two hot reversing mill drives in Britain to be fed from mercury-arc converters were engineered and manufactured by 'ENGLISH ELECTRIC' for the Darlington steelworks of Darlington and Simpson Rolling Mills Ltd. The first was commissioned in December 1958 and the second in February 1959.





This technique greatly reduces the number of rotating machines and their heavy foundations, resulting in lower initial and running costs, with minimum maintenance.

'ENGLISH ELECTRIC'

mercury-arc rectifiers

THE ENGLISH ELECTRIC COMPANY LIMITED, MARCONI HOUSE, STRAND, LONDON, W.C.2

Rectifier Substation Department, Stafford

RMA 21 WORKS: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL · ACCRINGTON

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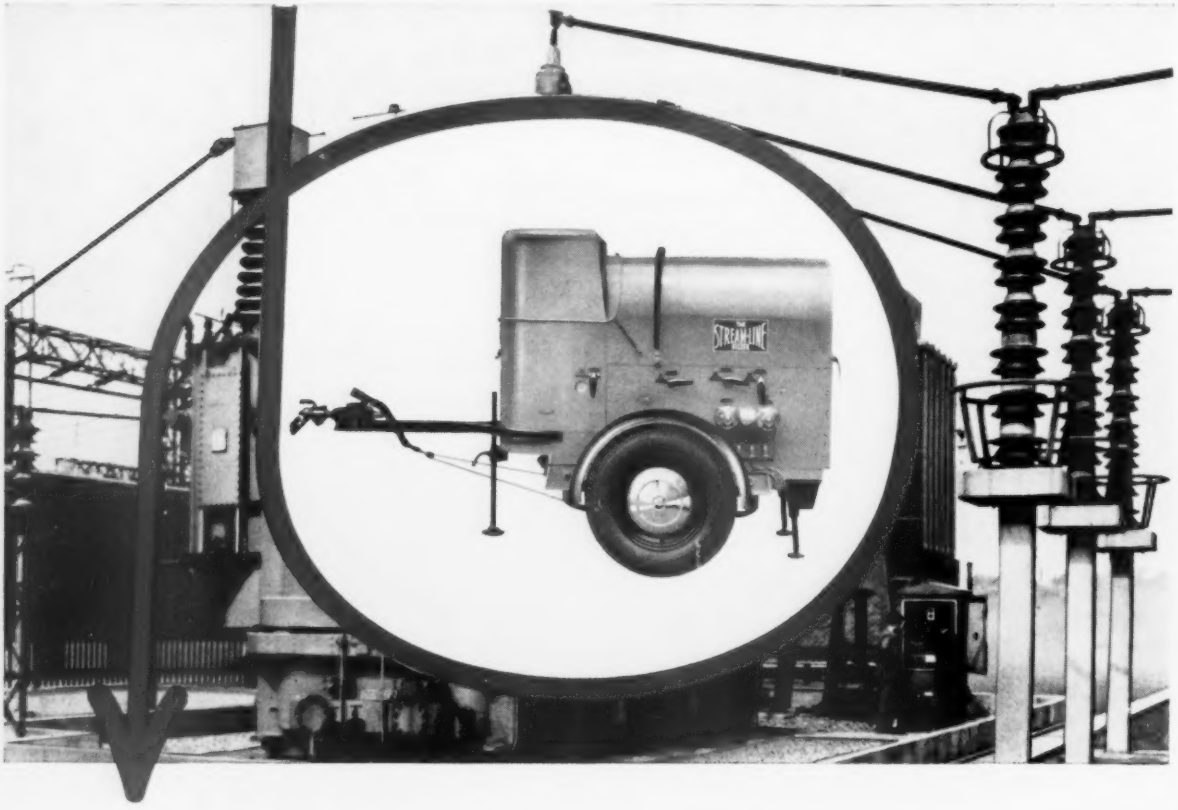
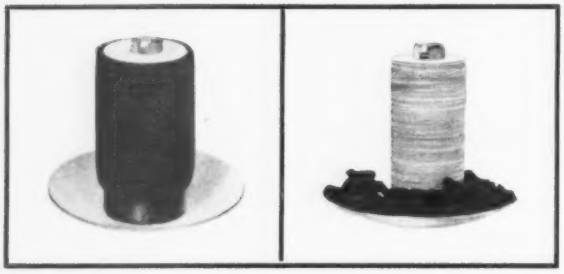


Loop in a Stream-Line filter



These illustrations show the Stream-Line filtering element built up of special paper discs under end pressure. Oil passes through the infinitesimal interstices between the discs leaving solid impurities at the paper edges. Instantaneous cleaning is carried out by a reverse flow of compressed air.

The security of oil-immersed circuit-breakers and transformers depends on the condition of the insulating oil, for if it contains impurities and moisture a serious loss of insulating protection will occur. The Stream-Line filter, embodying filtering elements, heating chamber and vacuum receiver, is the most perfect practical safeguard against this happening. A *single* passage of oil through a Stream-Line filter ensures the elimination of *all* solid impurities including the finest colloidal carbon. In addition, dehydration and de-aeration ensure the removal of all free and dissolved water and gases—*and the filtered oil will have a dielectric strength far above that specified for new oil.*

HIGH VACUUM

The standard Stream-Line filters, working at moderate vacuum, are fully adequate for most requirements but in order to cater for exceptional cases models are also available to operate under high vacuum. Treatment under conditions approaching absolute vacuum, combined with the unique Stream-Line edge-filtration principle, gives results with regard to the elimination of the last traces of air and moisture which are quite remarkable. Send us particulars of *your* special requirements.

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STREAM-LINE FILTERS LIMITED

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- SEE THE FULL RANGE IN ILLUSTRATED PRICE LIST No. CR.656.

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EAST MIDLANDS — J. A. PEARCE, HEAD OFFICE
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In the power cable field, too, a new cable drum symbolises the combined resources of Henley's, Liverpool Cables and Siemens Ediswan. For super-tension cables to the highest voltages or low tension paper or plastic insulated mains cables, AEI leadership is unsurpassed. You can rely on AEI.
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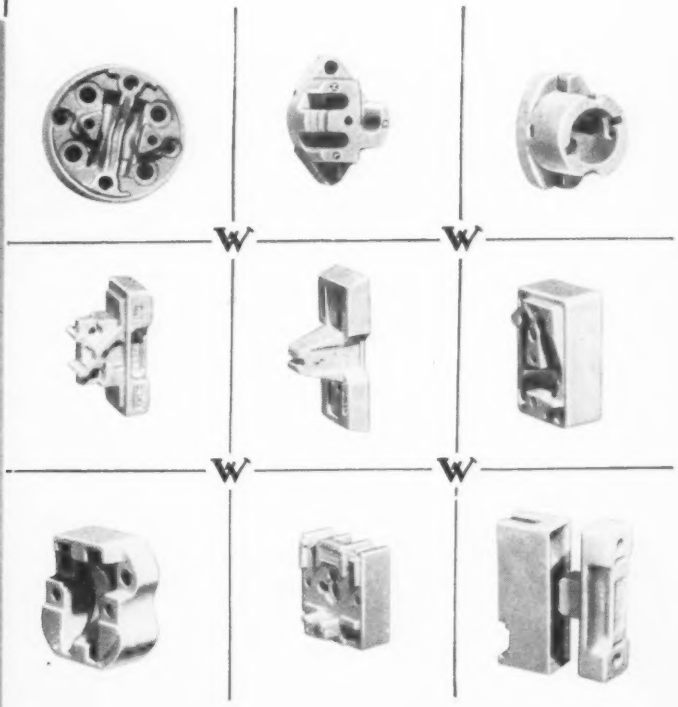
AEI CABLE DIVISION
Associated Electrical Industries Ltd
51-53 Hatton Garden, London, E.C.1
Phone: CHAncery 6822

5 x 12 equals 6 x 10 but...



...nothing equals porcelain for electrical insulation!

That is a fact—a fact which is proved more and more convincingly, as new materials come and go. Wade have specialised in the manufacture of electro-ceramics from the earliest days of electrical development and enjoy an unsurpassed reputation for accuracy, reliability, and fair price.
An enquiry will prove well worth while.

WADE
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Geo. Wade & Son Ltd., Burslem, Stoke-on-Trent.
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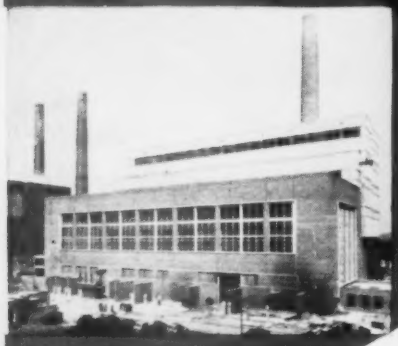
Members of the WADE Group of Potteries

BECMA
BRITISH ELECTRO CERAMIC MANUFACTURERS ASSOCIATION

It's Porcelain for Insulation... It's Wade for Porcelain

Aberdare chosen for Bold 'B'



The supply and installation contract for 33kV, 11kV and lower voltage cables at the recently completed C.E.G.B. BOLD 'B' Generating Station was awarded to Aberdare Cables Ltd.

A typical cable run installed by Aberdare at Bold 'B'

Aberdare Cables

ABERDARE CABLES LTD · ABERDARE · GLAMORGAN

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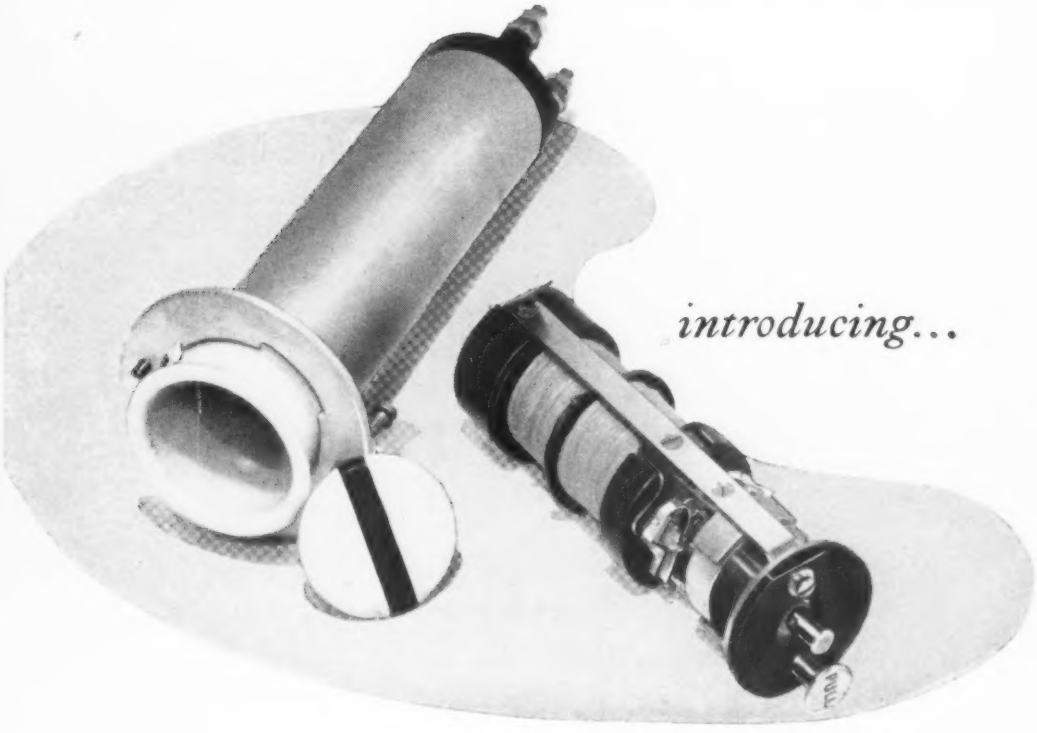
TGA AC 57



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... ... the new type-BA semaphore indicator for the automatic indication of the position of circuit-breakers and isolators.

The operating-coils of these indicators are continuously-rated but built-in contacts break the circuit on completion of movement to prevent unnecessary drain on battery supplies.

This semaphore indicator plugs in from the front of the panel and is available with discs of either 1 7/16" or 2½" diameter.

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"but not WOOTTON METER BOARDS Sir"

He's dead right! Here's a product with the strength to carry heavy loads, specially selected, specially *tested* wood that stands up to the most changeable climates, and endures indefinitely.

and don't forget WOOTTON wood blocks, sunk switch boxes and instrument cases.

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CLUTCH MOTORS

Designed for controlled acceleration and automatic clutch release

✻ *Complete information on the MARDRIVE range of Clutch Motors, sent on request. Write to:—*

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FREE PISTON GAS TURBINE INSTALLATIONS

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Manufacturers of precision resistors and potentiometers demand resistance wires so fine that they can hardly be seen. Some ask for wire with a high specific resistance. Others require a comparatively low specific resistance but it must remain constant with changing temperatures. Yet others call for wire with both a high and an unchanging resistance.
Wires are required in various tempers and finishes, for example, hard-drawn, annealed, bright, oxidised, enamelled, enamelled and silk-covered—there's no end to the variations needed for different jobs. Fortunately, there's no end either to our ability to meet them.
Superfine wires are produced from ·002 in. (0·05 mm.) downwards in alloys which are famous, Nichrome,* Nichrome* V, Karma* and Advance*. Alloys which offer all the necessary resistance properties. Finishes which meet all requirements. It's not surprising, perhaps, that our reputation in the superfine wire field is unique.

Nichrome* & Nichrome* V Nichrome* (65/15 type nickel-chromium-iron) and Nichrome* V (80/20 type nickel-chromium) are the alloys most suitable where a high resistance is necessary and where the change in resistance due to temperature does not hinder satisfactory performance.

Karma* This is essentially a modified 80/20 nickel-chromium alloy, developed especially for the electronics industry, which combines a high specific resistance with a low temperature coefficient.

Advance* Wires of this 60/40 copper-nickel alloy have a low temperature coefficient and a fairly high specific resistance—important properties in precision resistors which must have constant resistance over a wide temperature range.

For further information write for Data Sheet No. 1, a 4-page booklet containing comprehensive technical information.

*REGD. TRADE MARK

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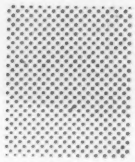
BRITISH DRIVER-HARRIS CO LTD

Cheadle Heath, Stockport, Cheshire

WHY INDUSTRY IS CHANGING TO CLASS C AND CLASS H TRANSFORMERS

THEY ARE FAR BETTER



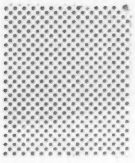
Class C & Class H *silicone-insulated, dry-type transformers are fire and explosion proof. They are not affected by dust and humidity. And because they will withstand repeated overloading, rating does not have to be based on peak loads. For safety, reliability and low maintenance costs, silicone-insulated transformers hold every advantage.*

THEY ARE OFTEN CHEAPER

First consider all the expenditure incumbent upon the installation of oil-filled transformers. Special bunkers and fireproof vaults are usually needed—and special fire-fighting equipment. The installation is often located a considerable distance from the load centre—which implies expensive low-voltage cable runs.

Now consider the very considerable cost-cutting advantages of Class C and Class H transformers as demonstrated for instance at the Kent factory of Medway Paper Sacks Ltd, a member of the Reed Paper Group. Here a 750 kVA 3-phase air natural cooled transformer, built by Ferranti Ltd, has been neatly mounted within the roof truss space. Space limitations —making it undesirable to build an adjoining substation for a Class A unit—together, of course, with freedom from fire hazard, were the major considerations. As a Group technician pointed out, the transformer's low weight enabled it to be sited thus, on a moderately-sized platform, making it possible to run 'a very nice low voltage distribution' to individual machines without floor excavations to accommodate long, costly cable runs.
And so, in simple indisputable terms, it often costs less to have all the advantages of a Class C or a Class H installation.

Midland Silicones Ltd supply the silicone resins and elastomers used in the manufacture of Class C and Class H transformers. Here is a list of well-known British manufacturers producing silicone-insulated dry-type transformers for the United Kingdom and overseas.



Associated Electrical Industries (Manchester) Ltd
Bonar, Long & Co Ltd
Brentford Transformers Ltd
Brush Electrical Engineering Co Ltd
Bryce Electric Construction Co Ltd
Crompton Parkinson Ltd
The English Electric Co Ltd
Ferranti Ltd
Foster Transformers Ltd
The General Electric Co Ltd
Gresham Transformers Ltd
Hackbridge & Hewittic Electric Co Ltd
London Transformer Products Ltd
Bruce Peebles & Co Ltd
South Wales Switchgear Ltd
Transformers (Watford) Ltd
Woden Transformer Co Ltd
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MS

MIDLAND SILICONES LTD

(Associated with Albright & Wilson Ltd and Dow Corning Corporation)

first *in British Silicones*

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Agents in many countries

MSE1

AMERICA orders testing equipment from FERRANTI LTD

A 14,000kVA A.C. High Voltage Cable Testing Equipment which will be the largest ever made in the United Kingdom has been ordered by the Anaconda Wire and Cable Company, Hastings-on-Hudson, New York, U.S.A. It will be used for routine production testing of cable up to 250,000 volts. The value of the order exceeds 250,000 dollars.

Ferranti Ltd. have specialised for many years in the manufacture of A.C. and D.C. Testing Equipments up to 1,000,000 volts and of Impulse Generators up to 4,000,000 volts.

Ferranti

Pioneers of the Electrical Industry with over 75 years' experience in research, development and manufacture

FERRANTI LTD · HOLLINWOOD · LANCASHIRE Telephone: FAilsworth 2000

London Office: KERN HOUSE · 36 KINGSWAY · W.C.2 Telephone: TEMple Bar 6666

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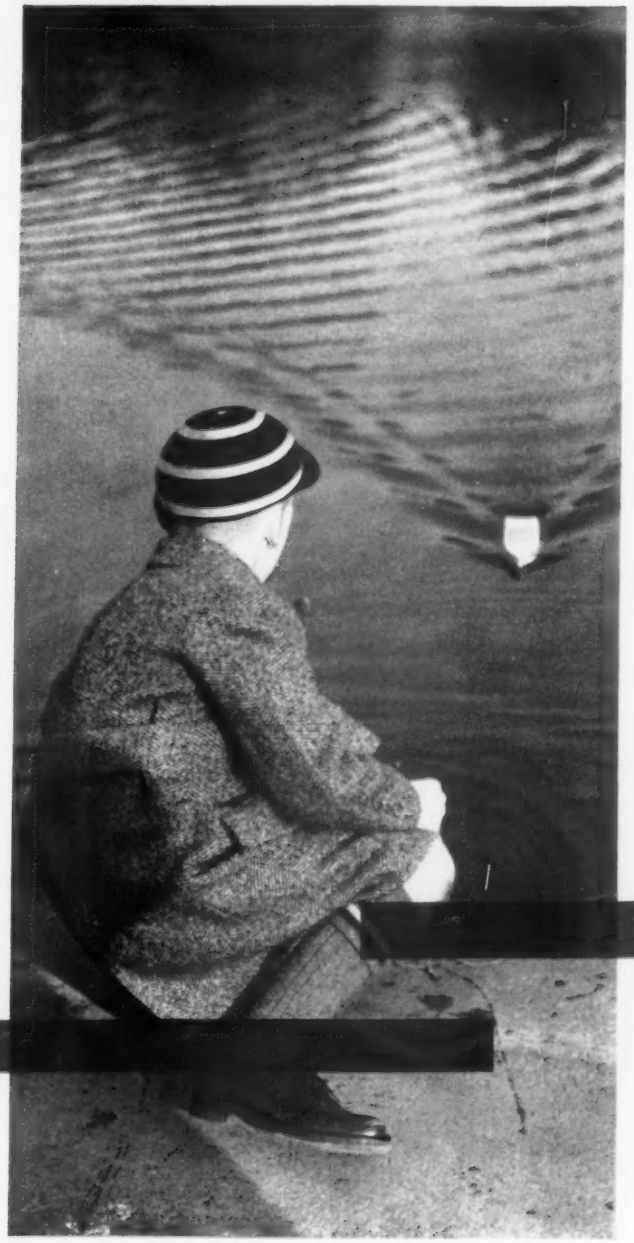
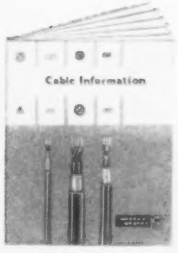


—but when it's a question of passing current from one point to another, whether in general purpose wiring, low tension power distribution or special industrial applications, Mersey Cables are called for.

As the cable manufacturing Company in the Electrical Division of the Tube Investments Group, Mersey have acquired long experience and incomparable skills. Their wide range embraces many advanced types including shaped conductor plastic insulated mains cables and solid conductor wiring cables. PVC general purpose cables are now being made to the new BS2004 and these, like Mersey's range of communications cables, embody the highest standards of reliability; furthermore, the latest and most efficient methods of production enable them all to be produced at economical cost.

Whatever *your* particular requirement, specify MERSEY, the first choice of practised cable users.

cable information



is a handbook recently produced by Mersey Cable Works and is devoted entirely to data concerning cables, their functions and applications. This invaluable and comprehensive guide to the most efficient use of cables is readily supplied on request.

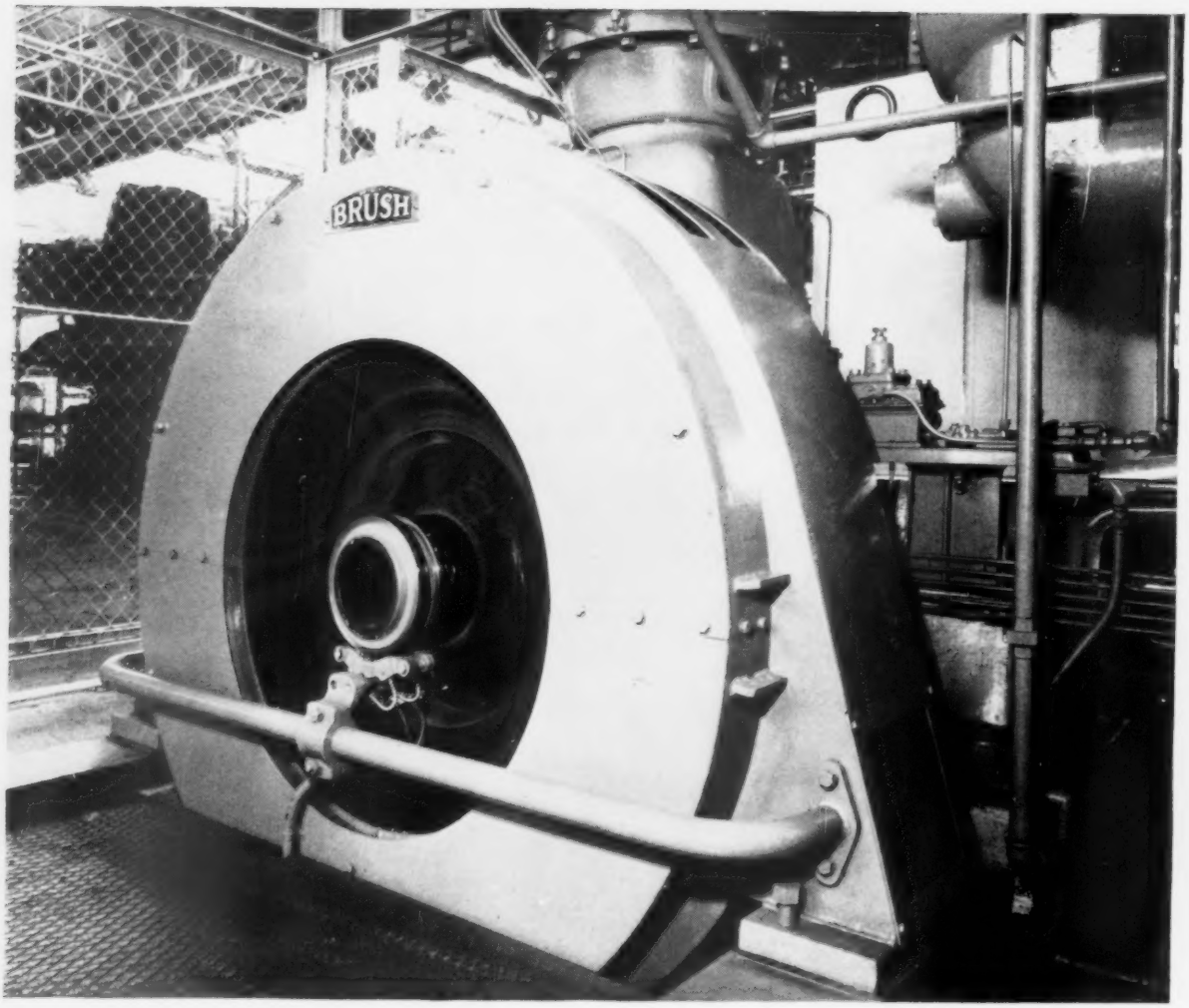
MERSEY CABLES

Mersey Cable Works Limited

Liverpool 20 Telephone: Bootle 4111

A TI COMPANY

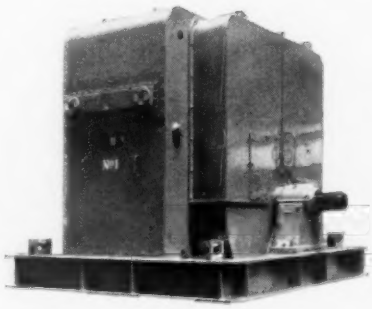
MCW27



Modern slow-speed compressor drive with overhung rotor

Brush synchronous motors provide the most compact electrically driven compressor arrangement possible.

- *Flywheel effect incorporated in motor—no other flywheel required.*
- *No bearings.*
- *Automatic starting.*
- *Static or rotary excitation and automatic static power factor control with cycling loads.*



Totally enclosed water cooled motor for rubber mixer drive

BRUSH

ROTATING MACHINES

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BRUSH ELECTRICAL ENGINEERING CO. LTD., LOUGHBOROUGH, ENGLAND *(Member of the Hawker Siddeley Group)* E5

NEWS SHEET

Blyth A heads top twenty thermal efficiency table with 33.88%. Average for all CEGB stations is 26.36% for 1959 calendar year, compared with 25.99% in 1958. (730)

20% deposit, 2 years to pay, new h.p. curb on most domestic electrical appliances, but 10% down and four years' repayment for water heaters and cookers. Three months' payment in advance required for rentals. (711, 737)

300 MW Ferrybridge B station opened; cost £49 per kW inst. 100 MW reheat sets, 1,500 lb/sq in., 975°F conditions, with 760 klb/hr unit boilers, unusual boiler house orientation. (722)

Molony Committee report calls for statutory safety rules for domestic equipment, but does not favour compulsory inspection or seal schemes. Proposed electrical scheme endorsed; early action wanted on colours of imported flexibles, but no steps to hamper do-it-yourself wiring. (711, 718)

TUC extends time for ETU's reply on alternative of legal action or judicial inquiry into ballot-rigging allegations, new dead-line 18 May. Now revealed that votes of 107 branches disqualified in recent ballot. (739)

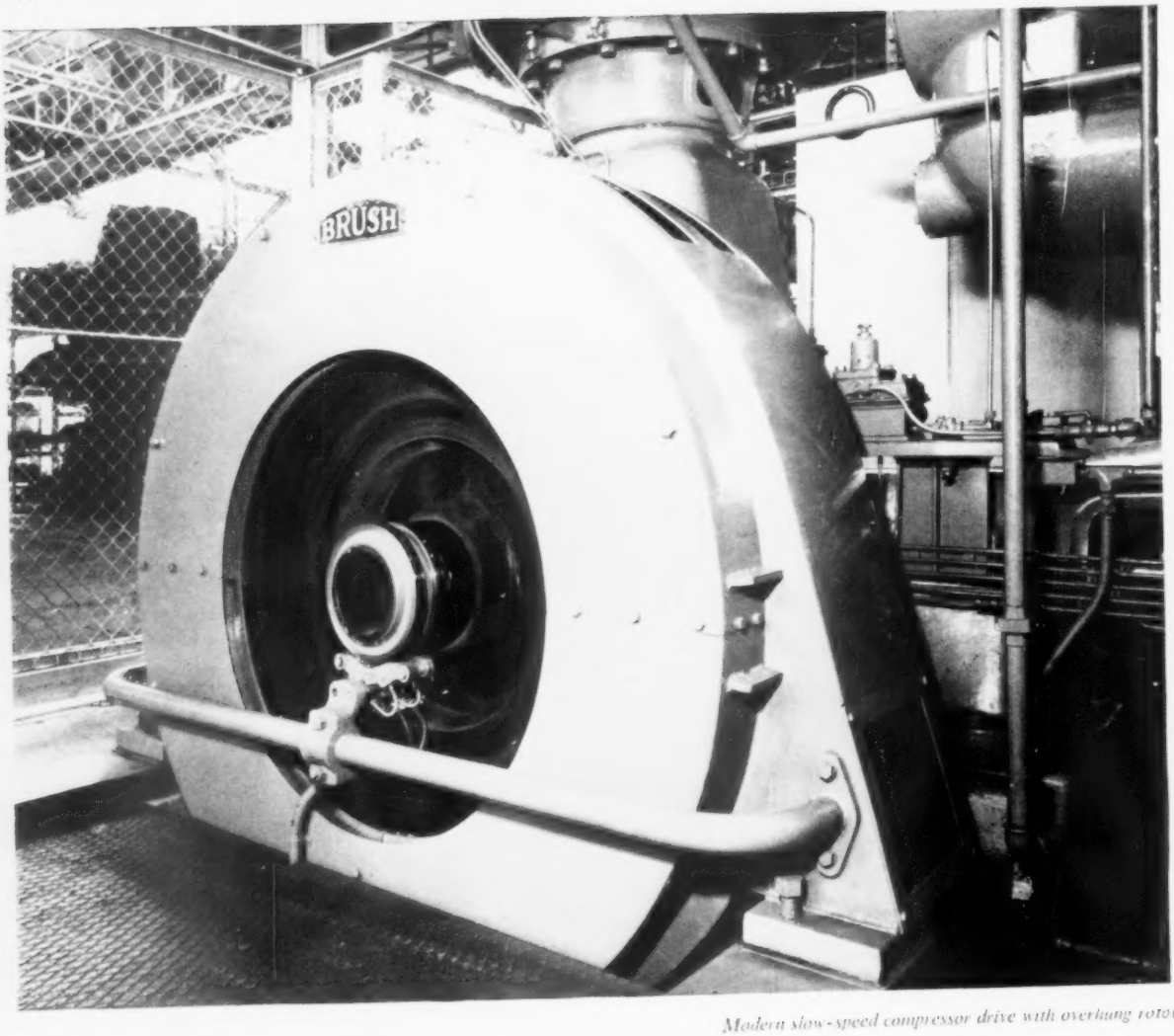
15% more light per watt from fluorescent tubes by grading phosphor particle size and introduction of water based binder, are two discharge lamp production techniques used at GEC Shaw factory. (719)

ERA plans new research committee structure, operative 1961. Aim is to make organisation more flexible, to speed availability of results of research. Annual report reviews research activities. (712, 717)

Pole amplitude modulation reduces size of two-speed induction motors as demonstrated by AEI 800 h.p. machine which would have formerly used two distinct windings. Fractional slot winding also gives size economy. (730)

No urgency for change to metric system, says British Association-Chambers of Commerce committees in joint report of two-year investigations. Trade not seriously affected by present system, but more decimalisation and some rationalisation of imperial system needed. (712, 741)

PEOPLE—J. R. Kinnersley promoted to management officer, LEB . . . P. Sydney appointed Chilterns sub-area manager, Eastern EB . . . Sir Ronald German to succeed Sir Gordon Radley (retiring) as director-general G.P.O. . . . J. M. Anderson leaves AEI to join Stella Lamp in Scotland . . . P. A. Charman becomes sales development manager, Semiconductors . . . M. H. Ley leaves Westool to join International Rectifier as sales admin. manager. (728, 729)



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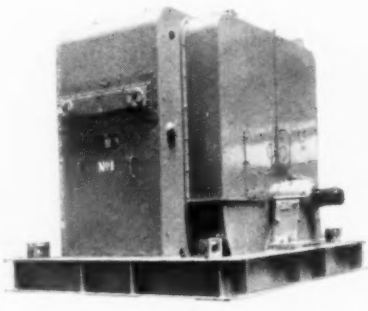

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Pole amplitude modulation reduces size of two-speed induction motors as demonstrated by AEI 800 h.p. machine which would have formerly used two distinct windings. Fractional slot winding also gives size economy. (730)

No urgency for change to metric system, says British Association-Chambers of Commerce committees in joint report of two-year investigations. Trade not seriously affected by present system, but more decimalisation and some rationalisation of imperial system needed. (712, 741)

PEOPLE—J. R. Kinnersley promoted to management officer, LEB . . . P. Sydney appointed Chilterns sub-area manager, Eastern EB . . . Sir Ronald German to succeed Sir Gordon Radley (retiring) as director-general G.P.O. . . . J. M. Anderson leaves AEI to join Stella Lamp in Scotland . . . P. A. Charman becomes sales development manager, Semiconductors . . . M. H. Ley leaves Westool to join International Rectifier as sales admin. manager. (728, 729)

NEWS SHEET

Performance of a.c. drives for marine auxiliaries, winches and capstans, discussed. Past requirement on d.c. systems not necessarily applicable to present a.c. drives. (713)

Aspects of British o.h. line practice considered too conservative in informal discussion contrasting British and US ideas. Validity of laboratory tests for certain mid-span splices questioned. (732)

Electrical exports slightly down in March at £21.6m. Best improvement by cables and domestic appliances. Radio and electronic gear below 1959 figures. Refrigerator imports exceed exports, reaching nearly £1m. (731, 739)

D.C. ends in Birmingham after 69 years, at final switch-off following change-over of last few consumers. (739)

Large three-roller pulveriser mills for High Marnham a feature of last week's Fuel Efficiency Exhibition. (733)

Urgent need of simple go, no-go earth loop impedance tester, suggests NICEIC, with target of £15 instrument for use on 13 amp installations. (712, 738)

Automatic production-line testing of electronic components for printed-circuit assemblies uses simple transistor equipment. Testing controlled by punched tape programme specifying parameters under test. (725)

New French colour TV system (Secam) shown at IEE. Performance claimed to be superior to American NTSC system. (742)

Radiant heaters stress relieve 200 MW turbine casing; permit stress relieving of complete fabricated half-casing instead of parts. (740)

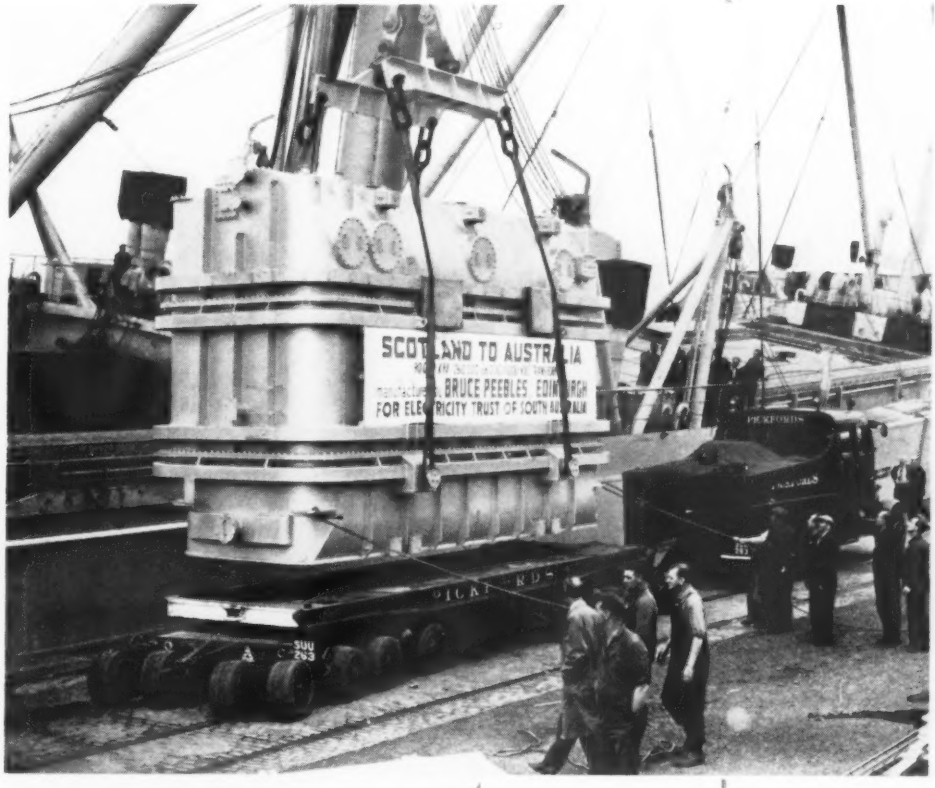
Contracting electricians object to ETU overtime ban; claim they will not participate in any bonus award. (737)

BUSINESS—Pressed Steel Co. to make rights issue of 5s. Ordinary, and Murphy Radio issuing new Preference and Ordinary shares . . . Increased profits by Elliott-Automation, Telephone Rentals, Power Securities Corpn. and Harland Engrg., but reduction by Worthington-Simpson. (744) . . . ICI & Alcoa (US) join in acquiring Almin (738)

OVERSEAS—USA's Dresden nuclear station in operation . . . New Palestine 150 MW power station nearing completion . . . Plans prepared for expediting next Snowy Mountains scheme . . . India gets $73m. loan for new thermal station . . . Holland's electrical exports increased 18% in 1959 . . . Second 100 MW set ready at Kariba . . . India to license further electrical production. (726, 727)

Scottish Transformers for Adelaide

Outward bound from Scotland this is the first of three 90,000 kVA transformers built by Bruce Peebles for the Magill substation of the Electricity Trust of South Australia.



The transformers will link the 275,000-volt power line from Port Augusta power station to the 66,000-volt metropolitan system in Adelaide.

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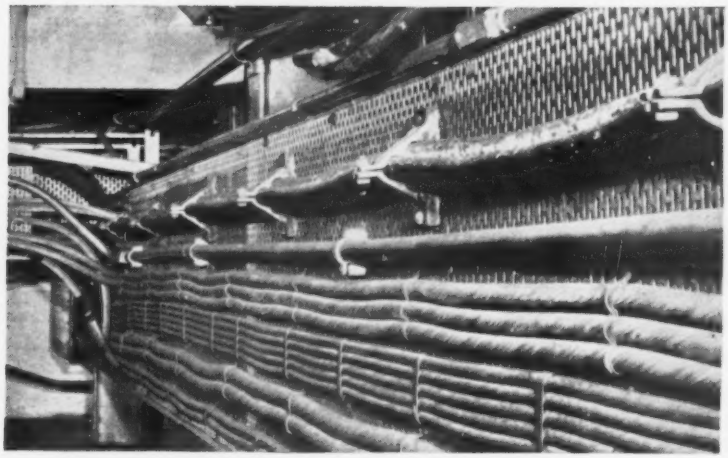

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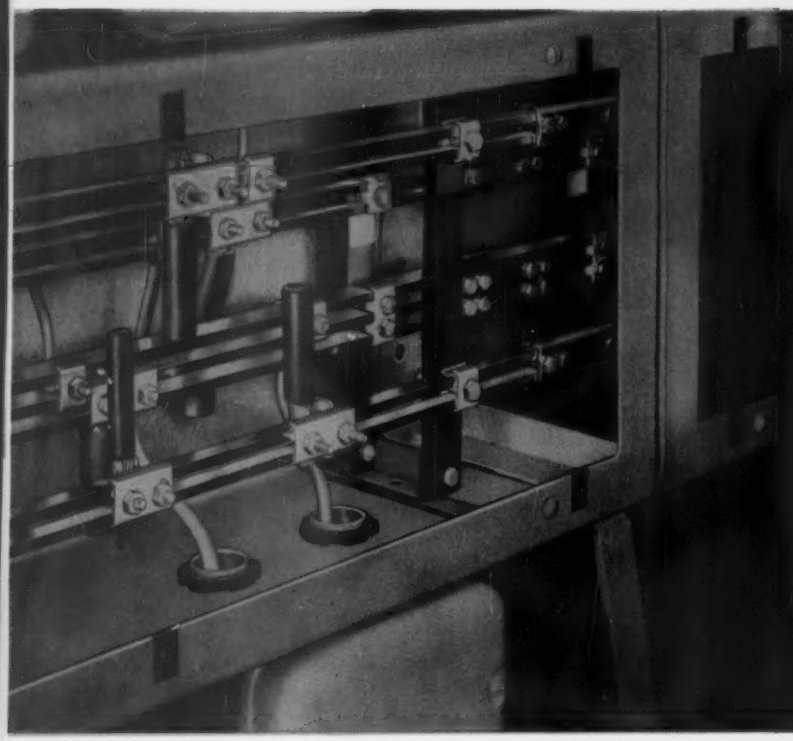

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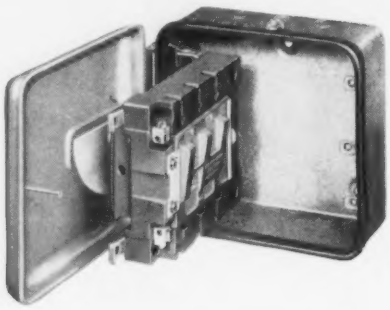
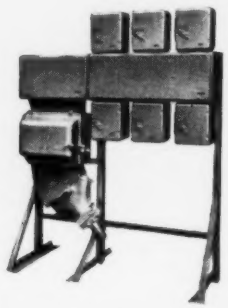


Star switchfuse with cover open showing interior hinged forward for ease of wiring.

Star distribution fuseboard.



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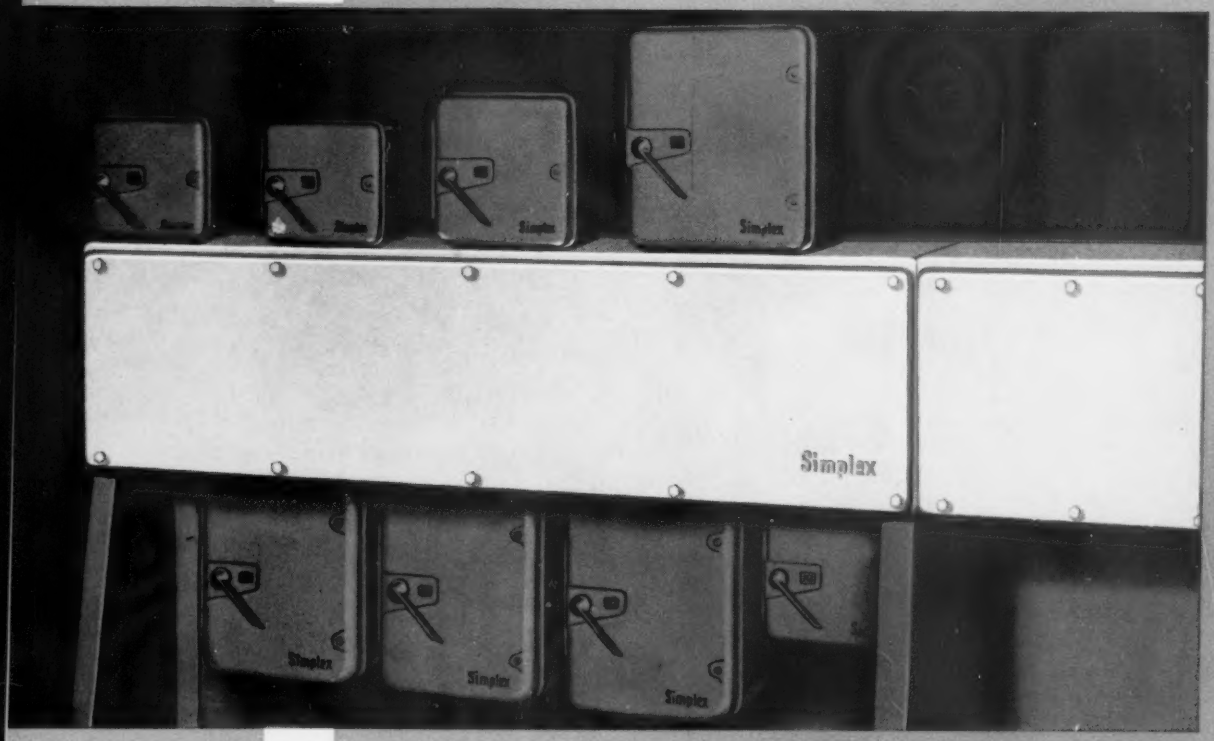

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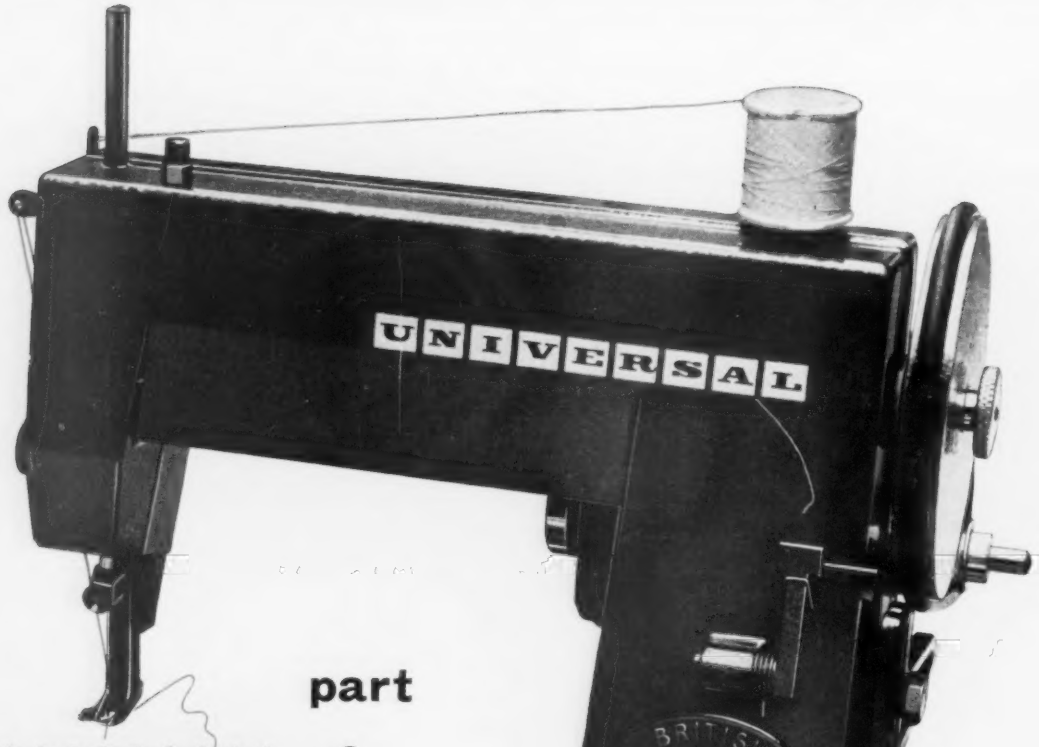

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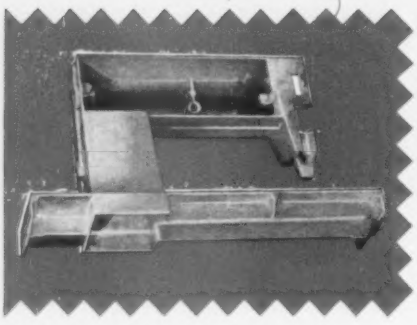

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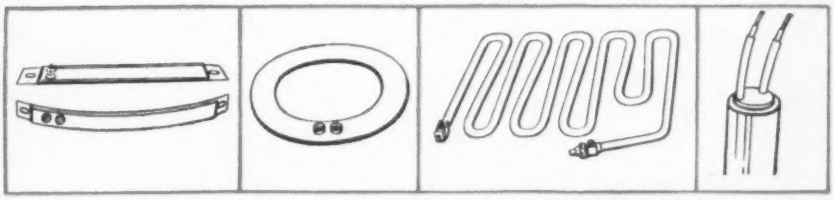

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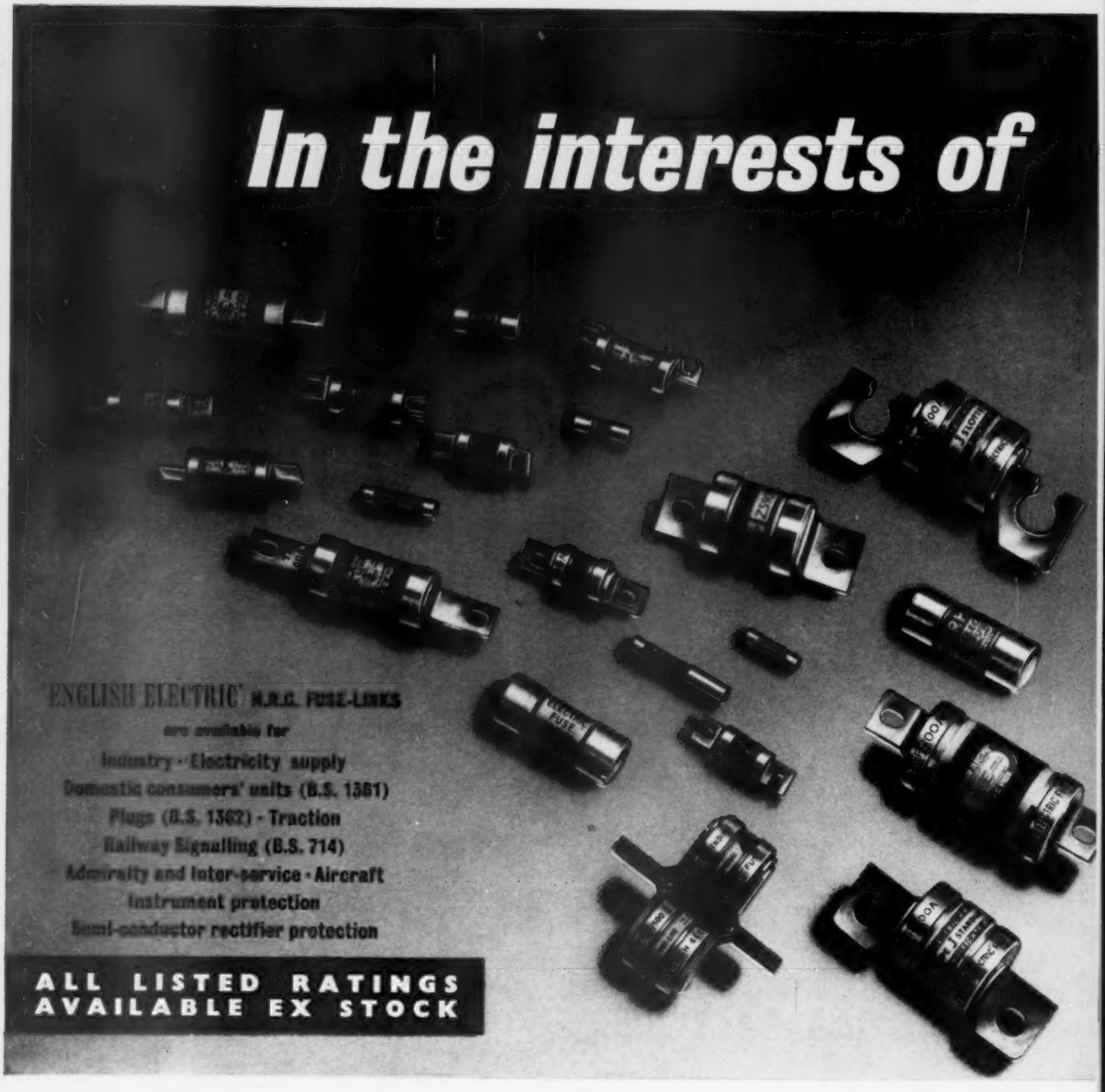

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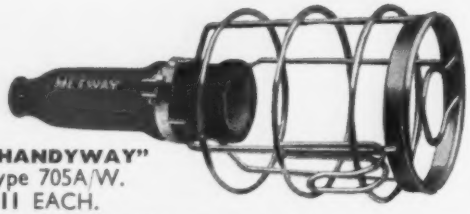

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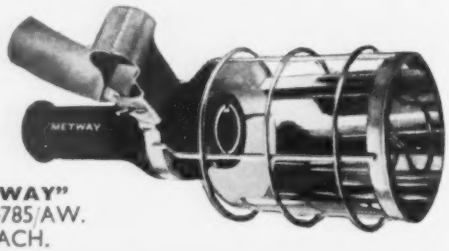

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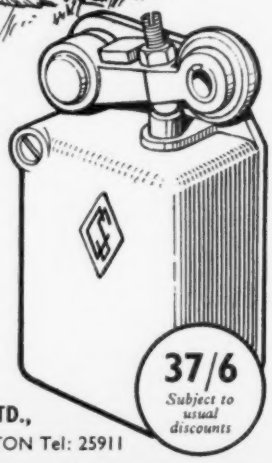

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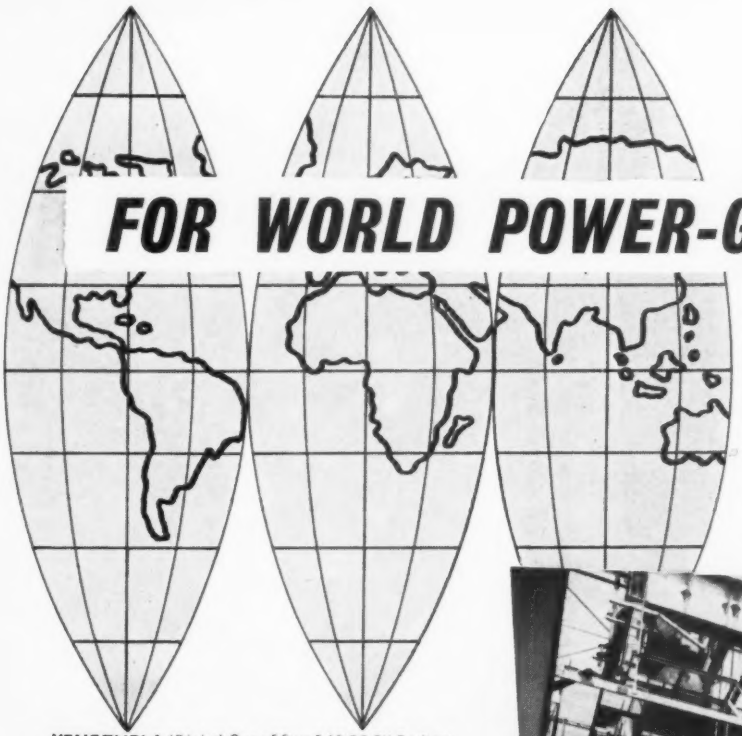

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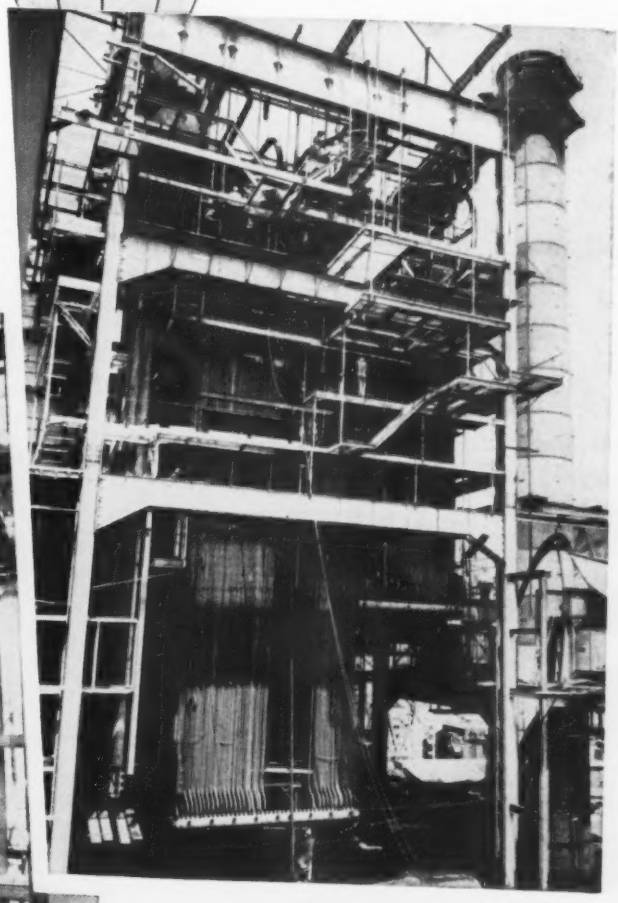
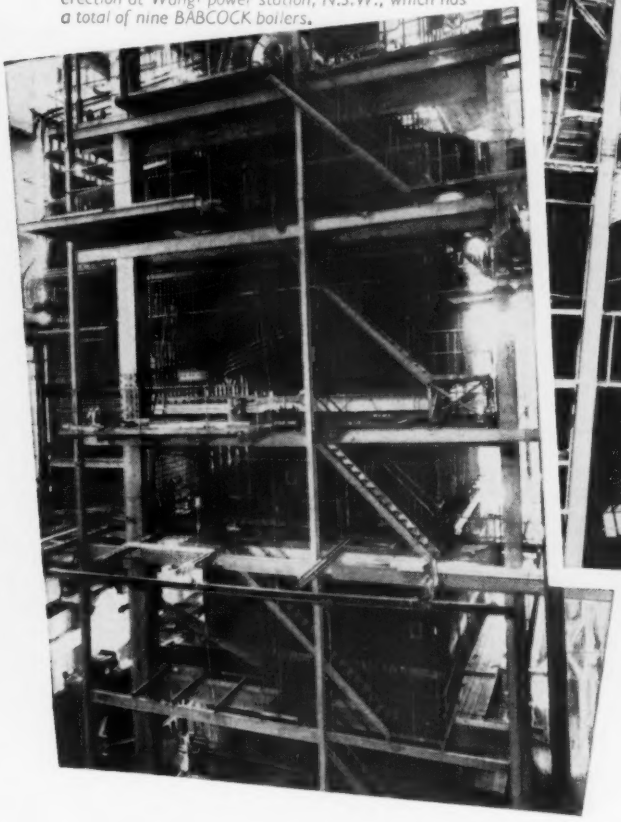


VENEZUELA (Right) *One of four BABCOCK Radiant boilers, natural-gas and oil fired, each rated at 550,000 lb./hr.; during erection for La Electricidad de Caracas. (Consulting Engineers: Sofina)*

AUSTRALIA (Below) *One of three BABCOCK Radiant boilers, each rated at 550,000 lb./hr.; during erection at Wangi power station, N.S.W., which has a total of nine BABCOCK boilers.*



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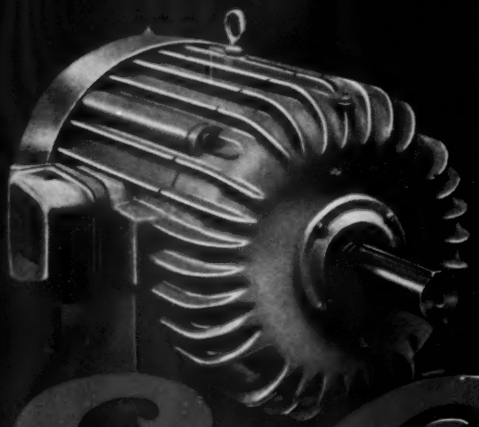

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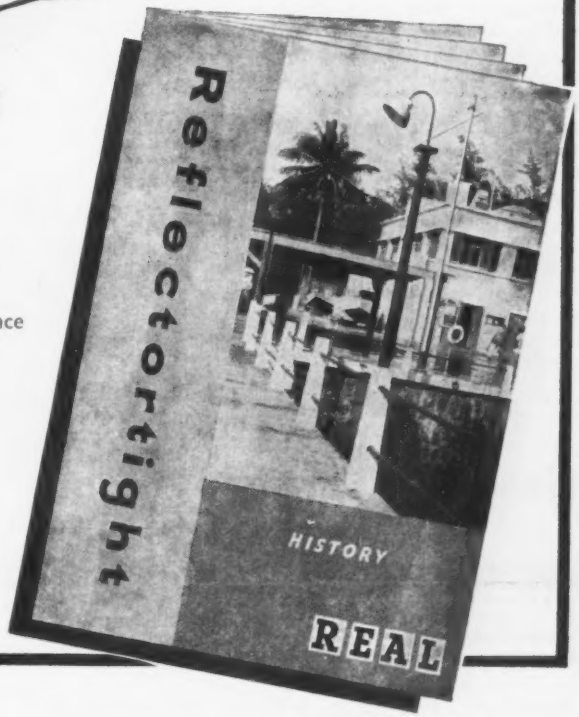

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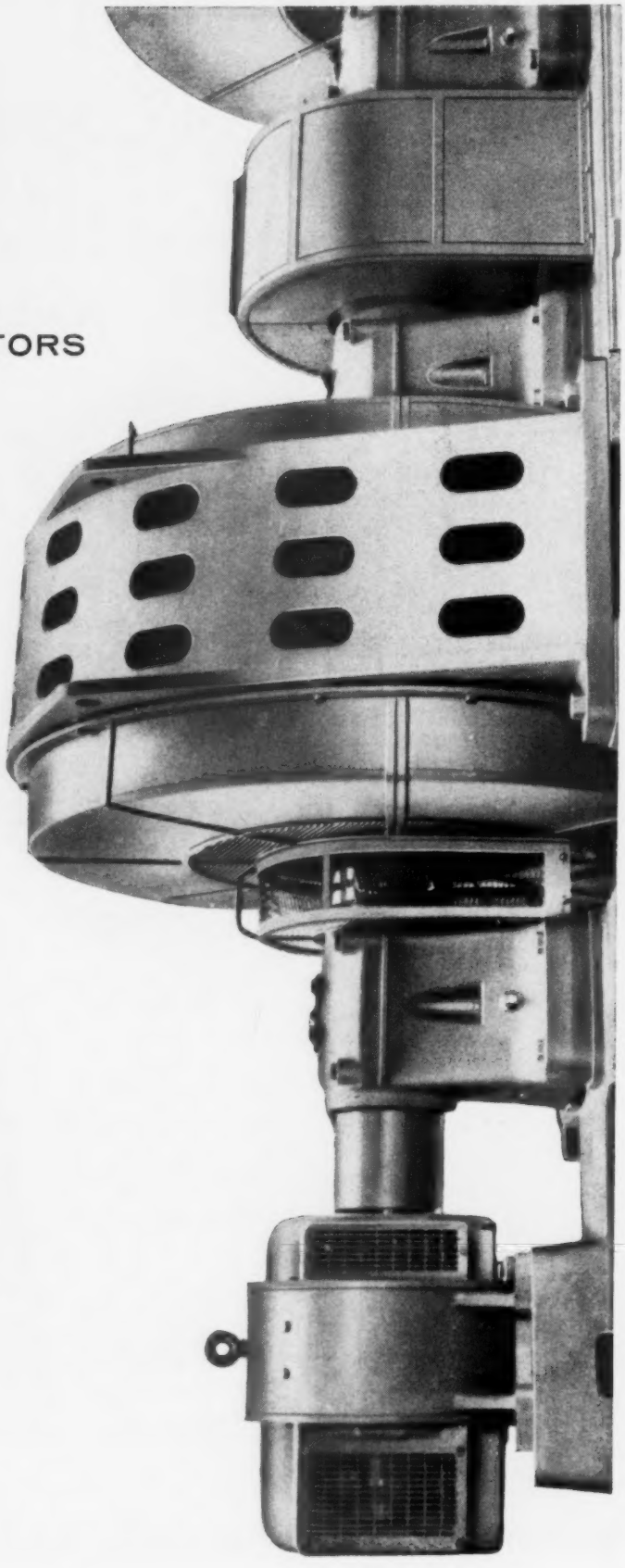

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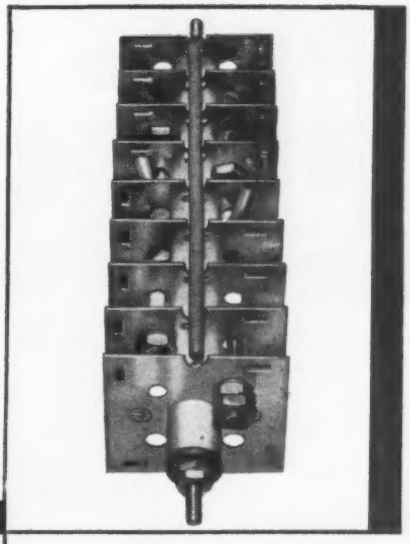

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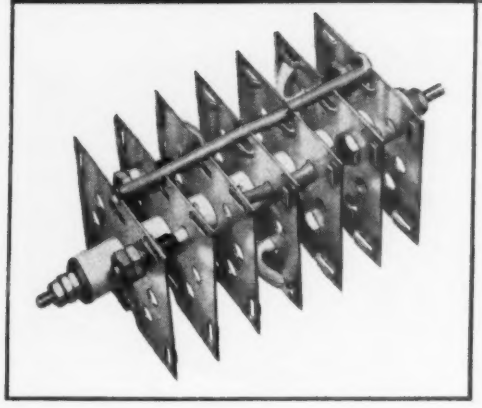

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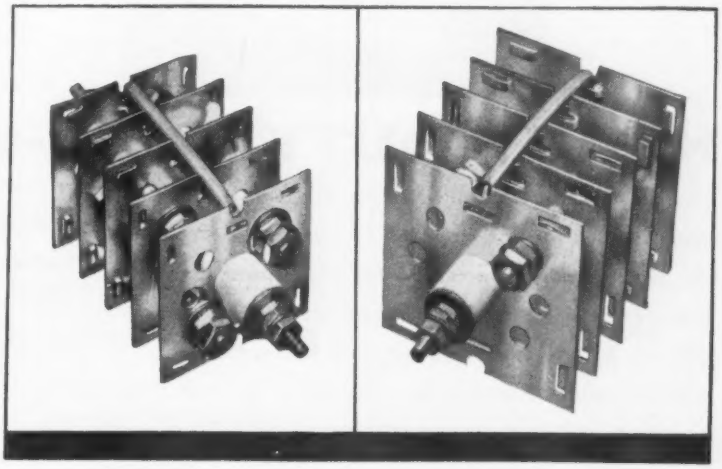

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THURSDAY 5 MAY, 1960
Registered as a Newspaper Volume 137 No. 18

ELECTRICAL TIMES

SARDINIA HOUSE, SARDINIA STREET, LONDON, W.C.2
Telegrams: Equivolt . Estrand Telephone: HOLborn 6016

Dans ce numéro

Treuils à courant alternatif pour les navires ... 713
Il existe trois types de commande de treuils qui peuvent être utilisés d'une manière satisfaisante avec le courant alternatif fourni par un navire. Ce sont: commande à vitesse unique et cage d'écureuil, commande à moteur jumelé à trois vitesses et cage d'écureuil et enfin les commandes avec systèmes de contrôle Ward-Leonard. Lors du choix des générateurs et des câbles destinés à alimenter ces commandes de treuils, les facteurs de charge devant être appliqués sont différents de ceux qui sont reconnus pour les installations à courant continu; les caractéristiques sont détaillées dans l'article. L'application de commandes à courant alternatif aux appareils auxiliaires de pont devrait être accompagnée d'un nouvel examen des conditions généralement acceptées pour les commandes à vapeur ou à courant continue.

Centrale électrique de 300 MW 722
Ferrybridge B est une centrale électrique de 300 MW située dans le nord-est de l'Angleterre. Elle est équipée de trois chaudières de 340 t/h. et de trois turbo-alternateurs de 100 MW. Les caractéristiques de la vapeur à la soupape d'arrêt de la turbine sont: 105 kg/cm2., 524° C., la vapeur étant portée à 513° C. par réchauffage à sa sortie du cylindre h.p. de la turbine à trois cylindres. Les alternateurs sont refroidis à l'hydrogène, deux à une pression d'hydrogène de 0,49 kg/cm2, un à une pression d'hydrogène de 0,70 kg/cm2. Ils sont reliés, par l'entremise de transformateurs-générateurs, aux réseaux principaux de 132 kV et de 275 kV

Assemblage automatique de panneaux de câblages imprimés 725
Une machine automatique sélectionne les parties composantes devant être soudées sur un panneau dont le circuit a été imprimé; elle les essaie avant que l'opération de soudage soit effectuée. Une bande perforée détermine l'ordre des opérations de la machine, qui est commandée à l'aide d'un transistor.

In dieser Nummer

Elektrische Schiffswinden mit Wechselstromantrieb 713
Es gibt drei Windenantriebsarten, die sich im Wechselstrombetrieb eines Schiffsverteilungsnetzes bewähren, nämlich der eintourige Antrieb mit Kurzschlussläufer, der zweimotorige Dreigangantrieb mit Kurzschlussläufer und der Ward-Leonard-Antrieb. Bei der Berechnung der zur Versorgung solcher Windenantriebe geeigneten Generatoren und Kabeln müssen andere Belastungszahlen eingesetzt werden als die für Gleichstromeinrichtungen zugelassenen Zahlen. Typische Werte sind in dem Artikel angeführt. Die Anwendung von Wechselstromantrieben auf Bordhilfsausrüstung erfordert ein Revidieren der bei Dampf- und Gleichstromantrieben geltenden Vorschriften.

300 MW Kraftwerk 722
Das Kraftwerk Ferrybridge B im Nordosten Englands ist für eine 300-MW : Leistung ausgelegt und umfasst drei Kessel mit einem Dampfverbrauch von je 340 T/St und drei Turbogeneratorsätze von je 100 MW. Am Dampfabsperrventil herrscht ein Dampfdruck von 105 kg/cm² bei 524° C. Nach Verlassen der Hochdruckstufe der dreistufigen Turbine wird der Dampf auf 513° C nacherhitzt. Die Wechselstromgeneratoren sind wasserstoffgekühlt u. zw. erfolgt die Wasserstoffkühlung zweier Generatoren unter einem Druck von 0,49 kg/cm² und des dritten Generators unter einem Druck von 0,70 kg/cm². Die Ausgangsleistung wird über Transformatoren an zwei Hauptverteilungsnetzen von 132 kV bzw. 275 kV angeschlossen

Automatische montage gedruckter Verdrahtungstafeln 725
Ein Automat wählt die auf einer gedruckten Verdrahtungstafel zu lötenden Bestandteile und prüft dieselben vor Ausführung des Lötvorgangs. Die automatische Maschine hat Transistorensteuerung; die Programmierung erfolgt mittels Lochstreifen.

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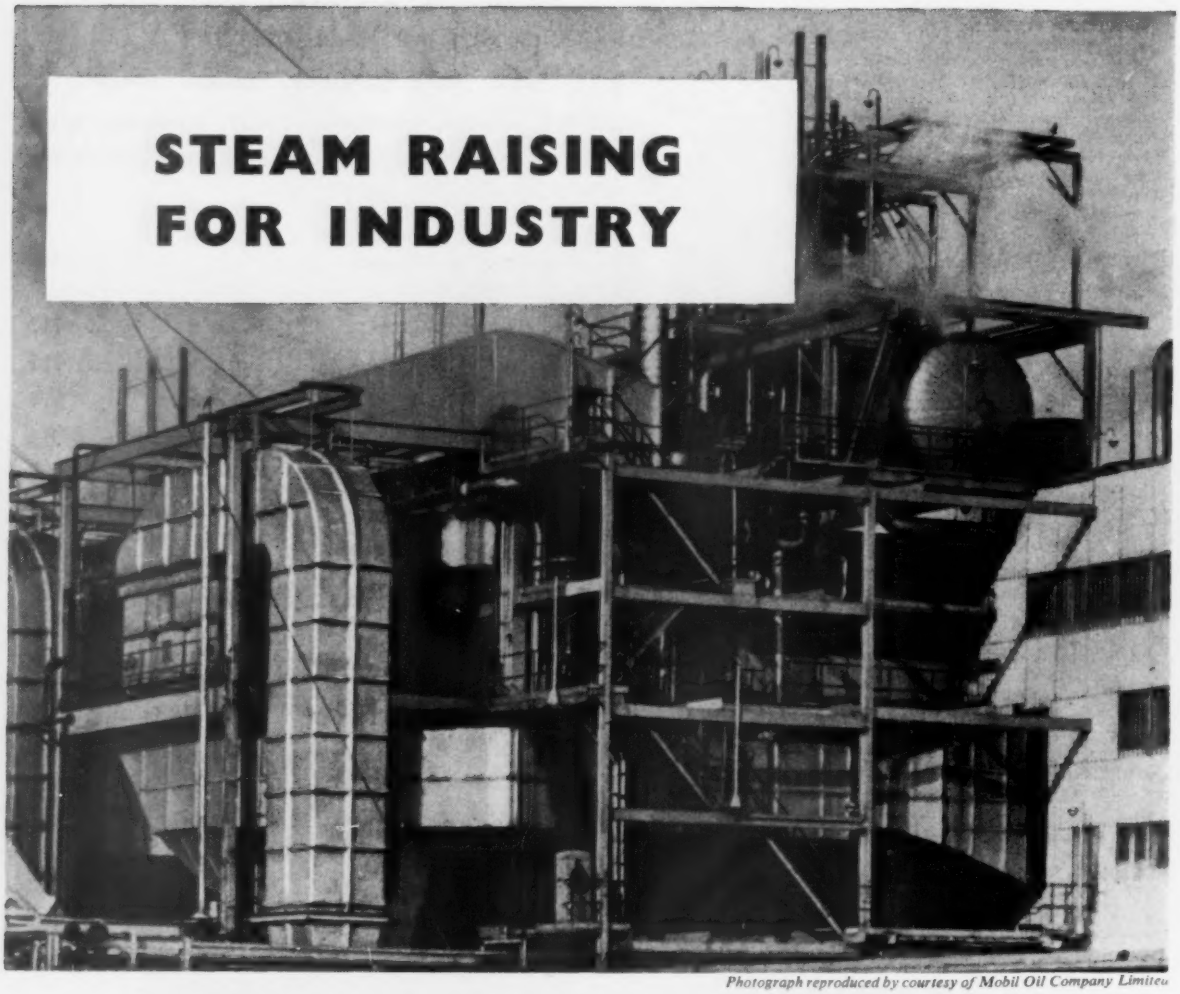
STEAM RAISING FOR INDUSTRY



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ELECTRICAL TIMES

ESTABLISHED 1891

THURSDAY, 5 MAY, 1960

Editor and Managing Director
ROY BALDWIN, M.I.E.E., Barrister-at-Law

Joint Editor:
K. C. POUNDS, B.Sc.(Eng.), A.C.G.I., A.M.I.E.E.

News Editor
T. W. WRIGHT

Comment

PARTIAL SQUEEZE

Once again electrical domestic appliances are selected for some of the restrictions in a protect-the-economy credit squeeze. The sales figures for refrigerators, washing machines and electronic entertainment equipment are likely to react sharply to the 20%, two-year limit now imposed, but elsewhere in the electrical field the effect may prove marginal. Since there were last restrictions on hire purchase and hire, there have been some important changes in the pattern of trading. Major domestic electrical appliances have become more accepted as normal up-with-the-Jones's possessions, so the incentive to find the new deposits is greater than it was 18 months ago when restrictions were "finally" lifted. Moreover, there is the growing use of bank and finance-house lending to pay for major appliances, rather than hire purchase through the retailer. The new official steps affect these sources only indirectly. Yet whatever ameliorating influences may exist in that respect, sales will slow down, and the planning of manufacturers will once more have been upset by political interference, a point of long-term importance to which BEAMA rightly draws attention in its official comment in the new changes. Importers are affected, too, and with the fast-growing quantity of electrical goods they are handling, that can prove an important factor. If those goods do not move fast, they may be the spearhead of an unhealthy surge of price-cutting as a way of releasing tied-up capital on the part of wholesalers and retailers. It will take two or three months for the complex effects of the new regulations to show themselves—two or three months before the correctness of their severity in relation to the nation's economic needs can be reliably judged.

MINISTER FOR SAFETY?

Last week's interim report of the Molony Committee on consumer protection was commendably terse in its discussion of safety legislation, but a price is paid for brevity in resultant uncertainty about the full line of thought of the committee on some important matters. Its main recommendation, to make one Minister responsible for administering safety legislation, is backed by a rejection of the idea that such legislation should involve testing and certification of the products involved. This seems to imply that the committee is thinking only of relatively simple safety regulations. It would be impracticable to administer a scheme for electrical appliance construction, for example, which did not involve representative samples of each make of product being tested and certified as complying with the appropriate standards—BS or otherwise. On the other hand, a requirement that

all equipment should have three-core flexes of a particular colour or that a warning notice should be fixed to electric blankets is within the ability of the local authorities to enforce without recruiting technical staff. The electrical industry is unlikely to be satisfied itself with such general standards; there is nothing in the interim report to dissuade the industry from continuing with its scheme for test houses and an approvals mark scheme. Although the Molony Committee clearly has reservations about existing approvals marks, it commends explicitly the proposed scheme for domestic electrical appliances being set up. This scheme justifies the committee's handsome compliment to the electrical industry's "jealous concern for the safety of their products," a comment given added merit by the acknowledgement of the relatively low frequency of domestic electrical accidents.

COOL ABOUT METRIC

British industry is cool about the idea of adopting the metric system. That is the overwhelming sense of the answers received by the British Association for the Advancement of Science and the Association of British Chambers of Commerce in their two-year joint investigation of the question. The extensive report issued this week makes it clear that a change to metric is not unwelcome in principle, but that hardly anyone feels a commanding need for the change. Many of the arguments advanced for the major complete swing from the pound-foot system evaporate under examination of practical trading and engineering practice. Metric and Imperial units get along together highly successfully in world trade. The committees clearly feel that in some indefinite long run, the gradual preference for the metric system will grow to a point where it is advantageous for Britain to take special steps, and they provide for this by suggesting formal machinery to give a two-yearly Anglo-American review of the question. For the present, though, a tidying up of the customary system by making more use of decimals and reducing the number of measures in use (e.g., eliminate stones and hundredweights) is thought the practical step to be taken. In reaching this conclusion, the committees have two comments which demand attention whenever the findings are discussed. The views it has considered are those of industry and commerce, without specific attention to the general public, and the possibility that there might be some inherent superiority about the metric system was explicitly excluded from consideration.

EARTH-LOOP TESTING ECONOMICS

If any routine test for wiring installations is to become a habit with wiremen rather than an occasional afterthought, it must be simple to apply and not too expensive in the equipment it requires for its performance. The earth-fault loop-impedance test is able to meet the first of these requirements, at least within fairly wide tolerances of accurancy, but it has involved relatively expensive as well as heavy instruments, and so it has never become accepted in the whole-hearted way its sponsors hoped. The key to securing a radical improvement in this situation is sketched in a recent progress report of the NICEIC. The Council has been giving urgent attention to this problem since its formation. It is that manufacturers' efforts should be concentrated on production of a testing equipment limited to use with 13 amp socket outlets, and capable of giving a go or no-go indication, without further refinements. A suggested target price is £15. The line of thought behind this recommendation is that possession of a few instruments of this type would be within the equipment possibilities of the smaller contractor, and that he might be willing for them to remain on site for a reasonable time—sufficient time presumably to meet the suggestion of IEE Wiring Regulation 507 that there should be an earth-loop impedance test from each final sub-circuit as well as an overall check on the completed installation. Progress to this point would be widely welcomed. There is a widespread feeling amongst contractors that the present situation is extremely unfair to them, requiring relatively heavy expenditure with the risk that a change in equipment design may render it nugatory.

FLEXIBILITY IN RESEARCH

Reorganisation of the control structure of the Electrical Research Association, outlined in the chairman's speech at yesterday's a.g.m., is in keeping with the aim of matching co-operative research closely with the requirements and resources of the industry. The plan is to reduce drastically the number of committees controlling the research activities of the Association, and to recruit these committees from the higher ranks of the electrical industry. Committee men of such status will have the effective power to pledge their organisations to provide the financial sinews required for any new research project, and the hope is that they will speed up decision taking, making it possible for the research programmes to follow more closely than at present the changing requirements of industry. The hope is expressed as well that a simplified structure will accelerate the dissemination of the results of research to members of the Association, an unquestionably desirable end. The change marks the continuing sense of urgency in the affairs of the ERA which Dr Taylor has so successfully fostered since his appointment, and which is to be seen as well in the missionary trips which the director and other members of the staff have been engaged in recently to attract a more widespread membership. The Association's annual report, published last week, reflects the range of ERA activities, and the international recognition its work attracts. The more effective administrative procedures proposed, together with the maturing plans for concentrating the staff at the new laboratores, should greatly enhance the value of that work to British industry.

Meteor

This week's quick summary of electrical news faces advertisement page 16.

A.C. electric ship winches

REVIEW OF TYPES OF MOTOR AND DRIVE FOR DECK USE

by A. Sidney Brown, M.B.E.*

WHILE the use of alternating current supplies on vessels has now become firmly established on the Continent and, to some degree, in the United States, it is only during the past five years that some British owners have made the change from d.c. to a.c. on dry cargo vessels. A.C. has, however, been used for a number of years on tankers, but this has been mainly due to the fact that cargo winches are not required and other deck auxiliaries are largely steam driven. As far back as 1946, a paper entitled "Alternating Current for Auxiliary Plants of Merchant Vessels"[1] was read in which the authors stated that "the field of application for a.c. systems will be extended greatly if and when satisfactory a.c. winch drives are available."

Cargo Winches

It can now be stated, without fear of contradiction, that satisfactory winch drives operating direct from the ship's a.c. system are available in various forms. These may be divided into three broad groups:

1. Single-speed, squirrel-cage drives.
2. Dual motor, three-speed squirrel-cage drives.
3. Ward-Leonard controlled drives.

Some may argue that these forms of winch drive have certain objections in comparison with the straightforward d.c. series machine but it must be remembered that all of the above a.c. drives have an advantage over d.c. winches in that they enable electrical control over the lowering of loads to be effected.

For those who want the simplest form of a.c. winch, a Group 1 type, employing a single-speed squirrel-cage motor, is available. This form of winch was first installed on the Brocklebank Line vessel, *Maskeliya*, and, after several years in service, the owners were so satisfied with the performance that they have installed winches of the same type in their first all a.c. vessel, the *Mangla*.

Fig. 1 shows a typical Group 1 winch suitable for installation on the open deck under both arctic and tropical conditions. With this type of winch there is no increased speed of hoist with a light load and the drive is through a spur-gear train with a two-speed mechanical gear change enabling up to half loads to be handled at twice full-load speed. The a.c. motor is of high torque pattern, built in to the mechanical unit and a d.c. disc type, magnetically released brake is provided, together with a hand operated brake release to cover the eventuality of a power failure and to allow loads to be lowered in safety. An independent pedal-operated brake is provided.

Dual Motor, Three-speed Drives

In Group 2, the three-speed s.-c. motor winch has been installed on many vessels during the last few years. One winch of British manufacture will shortly be available and at least two continental versions are on the market.

All winches in this group are similar in the main respects. The motor is a twin-rotor, high-torque type, one in association with a 32-pole stator and the other with an eight-pole stator which, by switching, can be connected as a four-pole stator. The first step, with the 32-pole stator energised, gives slow speed for "breaking out", decking and inching. The second step, with the second stator energised as an eight-pole winding, is the normal one for raising and lowering heavy loads while the third, with the four-pole winding, is the high-speed step for all normal loads but is also capable of handling heavy loads as well. Lowering speeds are slightly higher than those for lifting as the speed of an induction motor alters only slightly when changing over from driving to being driven by the load. In every case a d.c. type magnetic brake, energised through a rectifier, is also incorporated.

Controllers are of the deck pedestal type, with an automatic timing device arranged between the second and third steps to ensure that starting is effected in at least two separate steps. Braking operations are similarly controlled and, just before the mechanical brake is applied, the 32-pole winding is energised to reduce the wear on the friction braking surfaces to a minimum.

The main difference between British and continental design is that the former is a self-contained worm-gear

* Based on a lecture by Mr Brown given at the Royal College of Science and Technology, Glasgow, March, 1960. Mr Brown is with Clarke Chapman and Co.

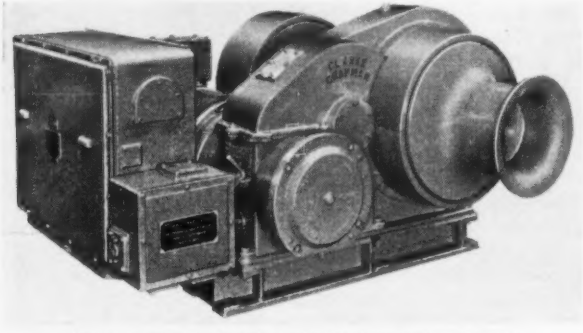


Fig. 1. Cargo winch with single-speed squirrel-cage motor

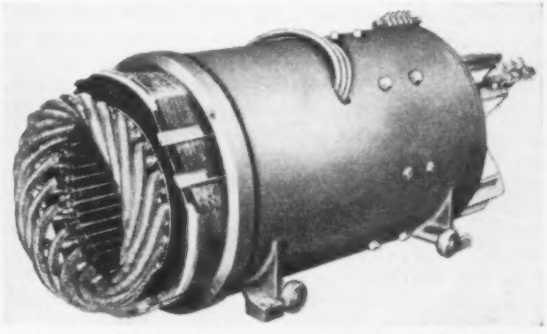


Fig. 2. Ward-Leonard set with removable stator and windings

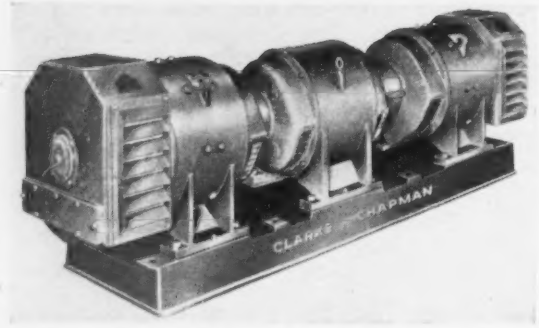


Fig. 3. A Ward-Leonard motor generator set for two winches

driven type with the contactors integrally mounted, while the continental practice is to use spur gears, sometimes with additional mechanical gear change, and contactor panels separately mounted in a deck housing which entails extra wiring. Both German and Danish designs are available.

Ward-Leonard Drives

There are several British and continental types of drive in Group 3 incorporating Ward-Leonard control. It has always been a debatable point as to whether high light-load speeds are really necessary and two schools of thought exist. The use of a.c. winches, especially on foreign-built tonnage, tends to support the school which holds that they are not; moreover it is an oft-spoken claim in their favour that s.-c. motors give less trouble and maintenance than d.c. machines with commutators and brush gear but against this must be laid the higher maintenance which is inevitable on the three-phase contactors and may be even greater than that necessary for the brush gear on the deck machinery.

For the school which supports d.c. on vessels with a.c. supply systems there is the Ward-Leonard control which gives an automatic rise in speeds for reduced loads, both when hoisting or lowering, combined with a tight regulation of speed without the use of brakes merely by the use of a master controller. The electrical equipment consists basically of the d.c. winch motor, a d.c. generator driven by an a.c. motor, a rectifier to provide excitation current to the generator, a generator field controller and a starter for the a.c. motor.

The methods of obtaining high light-load speeds will be discussed later but, when considering the problems of cargo handling, it is acceleration rates with loads which are probably of more importance than high speeds of raising or lowering alone. One thing in favour of this system of control is that, no matter how roughly the control is operated, even to the extent of switching the controller from "full lower" to "full hoist" without pause, no damage can be done to the winch motor and, what is probably more important, no heavy current surges are imposed on the ship's generating system. The only time when there is an appreciable current surge is when the Ward-Leonard set for a winch is started up. This only occurs once for each winch per cargo handling period and does not exceed four times full load current for a second or so.

So far as versatility of control and kindness to the ship's supply system are concerned, Ward-Leonard sets are, without doubt, the best answer for an a.c. ship but there are two d.c. machines with associated brush gear to maintain as well as a s.-c. three-phase motor with its contactors and starting gear. Moreover, the overall efficiency is lower and, once a set is started up, there is a steady low power-factor drain on the ship's system while the winch is stationary.

If a set is shunt wound, the voltage characteristic will be fairly flat and, as a consequence, there will be little inherent difference in the speed at which light or heavy loads are lifted; on the other hand the accelerating torque will be quite massive. With a differentially wound set (that is, the generator is compound wound with the shunt and series fields differentially connected) the voltage characteristic will be a steeply rising one giving an inherently high light speed but with limited accelerating torques for heavy loads.

By suitable design, it is possible to provide a winch which gives a light hook hoist at 2½ times the speed at full load but the winch will stall at a little over the full-load torque. The winch, therefore, has no overload capacity but gives high light hook load speeds without the use of relays, contactors, etc. Since winches are rarely used to the full capacity, a common load being 20 to 30 cwt, this simple arrangement has much to commend it, seeing that half loads are lifted at twice full-load speeds, so utilising the available horse-power to the full.

If it is thought necessary to provide ample accelerating torque for a full-load lift, some overload capacity and also a high light hook speed, the characteristic requires some modification. One method is to employ a field-forcing relay to give an accelerating "boost" by strengthening the generator shunt field momentarily during the period of acceleration. As soon as the load is up to speed the relay drops out and field strength reverts to normal, the operation being completely automatic and inoperative while normal loads are being handled.

The latest Royal Mail liner, the *Amazon*, is equipped with Ward-Leonard winches. These are completely self contained, apart from the wiring between the winch and the controller, and all the shipbuilder has to do is to supply and interconnect the cables between and also from the winch to the ship's a.c. busbars. Incidentally, the motor generator set is on rollers for easy removal and the a.c. stator of the motor is removable for repair or replacement. Manufacturers are often asked to supply a set of stator coils as a spare but it is a well-known fact that it is difficult to carry out a satisfactory stator rewind on board and, by employing a removable stator unit, a spare stator can be held in stock for quick replacement by the normal ship's personnel. (Fig. 2.)

Transductor control

An interesting modification to this type of installation, recently announced, is one in which the contactor gear has been replaced by a transductor and control is effected by varying the current in the saturating windings, the current being related to the load on the winch. This regulates the a.c. output of the transductor, which is rectified and fed into windings on the winch motor field, adjusting the field-winding strength to suit the load and so taking the place of current relays and field contactors.

It is also possible to have a single a.c. motor driving two Ward-Leonard generators with independent field supplies for two winches. In another form the motor drives dual-output generators, each capable of supplying two winches simultaneously or separately. The armature has a normal winding and a single commutator with a four-pole field winding and four brushes. Opposing pairs of field poles and related opposing brushes provide the control and supply for one winch in each dual-output generator. Compensating coils are wound on to the fields to prevent interference between each output.

Electro-hydraulic winches are also to be found on some ships. These are conventional winches driven by hydraulic

motors deriving their supply from hydraulic pumps coupled to continuously running electric motors. As the pump can be started up with hydraulic valves open and no load, this is an ideal application for a squirrel-cage motor with direct-on-line or star-delta starting. Winches of this type can either be operated in groups from a common motor-pump unit or, preferably, each can have its own self-contained unit. Control of the hydraulic motors is, of course, by valves.

Loading on Generators and Switchgear

Let us now consider the effect of a multi-winch installation on the cables and generating capacity of a ship's a.c. system. If we take, as our common basis, the generally accepted load factors for d.c. cables on winch circuits and scale them to the conditions applicable to a.c. winch drives, we shall obtain an approximation of the allowance in cable sizes which may be expected in each case. For the d.c. installation the load factor is around 1 for the two-winch case and increases in linear proportion up to 8 for the 24-winch case. For a.c. installations using squirrel-cage motors the proportion is again linear ranging from 4 to 10·5 over the same range or, for Ward-Leonard equipment, from 1·5 to 5.

This factor in a d.c. installation is often taken as a guide to loading on the ship's generators as well but it should be higher for the smaller installations—about double the cable figure for a two-winch case—and lower than the cable value for ships with more than 16 winches. Load factors for alternators are, however, higher than cable factors all along the line, ranging from about 6 to 15 for squirrel-cage motors and 2·6 to 7 (the same as for d.c. generators) for Ward-Leonard sets. The full load current is, however, higher with the Ward-Leonard than the d.c. equivalent on account of the greater losses in the motor generator combination.

The effect of these load factors on the system for the three cases is shown in Tables 1-3. From Table 2 it is evident that, with squirrel-cage winch motors, there must be a considerable overload capacity in the alternators.

Table 1. D.C. Contactor Type Winches
Starting Peak = 160% Full Load
Winch Motor kW = 37·5

No.	Load Factor	kW	GENERATOR				PRIME MOVER	
			Starting		Running		Start	Run
			Load	kW	Load	kW	kW	kW
2	2·6	97	124%	120	77½%	75	120	75
4	3	112·5	106%	120	80%	90	120	90
6	3·5	130	92%	120	104%	135	120	135
8	3·75	140	128%	180	97%	135	180	135
10	4·15	155	116%	180	87%	135	180	135
12	4·6	172	106%	180	105%	180	180	180
16	5·5	206	116%	240	87½%	180	240	180
20	6	225	106%	240	104%	225	240	225
24	7	260	115%	300	104%	270	300	270

Table. 2. A.C. Squirrel-cage motor winches
Winch motor input 37·5 kW = 45 kVA @ 0·83 Power Factor.
Starting Peak, 400% f.l. current; 180 kVA @ 0·4 Power Factor.

No.	Load Factor	kW @ 0.8 P.F.	ALTERNATOR				PRIME MOVER	
			Starting		Running		Start	Run
			Load	kVA	Load	kVA	kW	kW
2	6	225	130%	360	33%	90	144	74.5
4	6·75	252	118%	360	36%	115	144	90
6	7·5	280	107%	360	48%	173	144	135
8	8·5	318	140%	540	42½%	173	216	135
10	9·5	356	126%	540	38%	173	216	135
12	10	375	120%	540	48%	230	216	180
16	11·5	430	140%	720	42%	230	288	180
20	13·5	510	118%	720	44%	287·5	288	225
24	15	565	132%	900	48%	845	360	270

Table 3. Ward-Leonard Type Winches
Motor Generator input = 48 kW per winch.
Starting Peak 100% f.l. current.

No.	Load Factor	kW @ 0.8 P.F.	ALTERNATOR				PRIME MOVER	
			Starting		Running		Start	Run
			Load	kVA	Load	kVA	kW	kW
2	2·6	125	77%	120	77%	120	96	96
4	3·0	144	67%	120	78%	140	96	112
6	3·5	168	57%	120	100%	210	96	168
8	3·75	180	80%	180	93%	210	144	168
10	4·15	199	72%	180	85%	210	144	168
12	4·6	221	65%	180	102%	280	144	224
16	5·5	264	73%	240	85%	280	192	224
20	6·0	288	67%	240	97%	350	192	280
24	7·0	336	71%	300	100%	420	240	338

Comparison between Tables 1 and 3 show how the lower efficiency of the Ward-Leonard drive increases the running current above that of the comparable d.c. installation but, on the other hand, the fluctuations through starting peaks are much reduced.

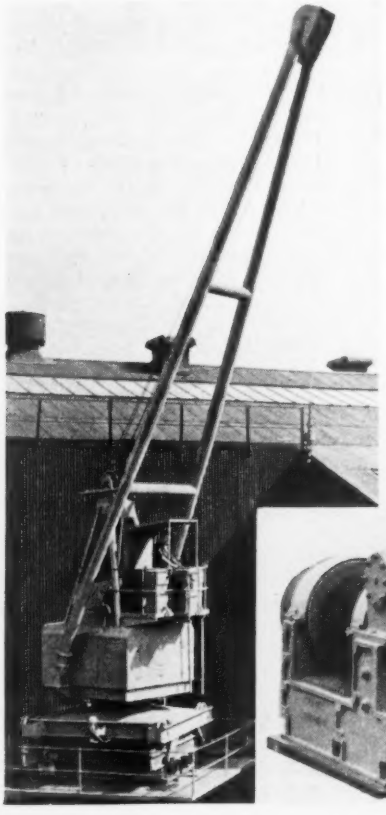
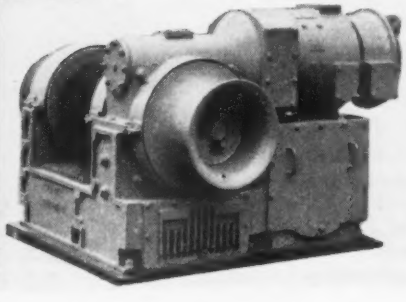
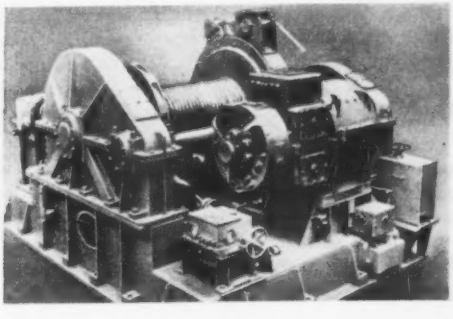


Fig. 4. Tubular type level luffing deck crane with enclosed motors and control gear on carriage for travelling athwartships

Fig. 5. Below, a Ward-Leonard winch on the "Amazon"

Fig. 6. Right, the Almon Johnson winch





All of these load factors should be considered as a minimum unless it has been ascertained that the makers of the alternator and prime mover have designed their machines to accept the starting peaks on a kW basis with adequate copper to carry the considerable low power factor peak currents without excessive voltage drop, otherwise there will be a continual and intensely irritating flicker of the lighting on board while the winches are being worked. For this reason alone it is advisable, if possible, to put in a special generator for the lighting circuits.

Warping Winches

This type of winch must be capable of being stalled without damage and must also have a high speed for handling slack rope. Two-speed s.-c. motors, slip-ring induction motors and Ward-Leonard drives have all been used with success, the latter being particularly suitable for this duty. Some manufacturers incorporate overload trips on s.-c. motors to deal with the stall condition but this is not to be recommended. The winches should always be capable of exerting a safe, live pull. A torque limiting practice which is, however, acceptable is the use of a torque limiting relay to switch the motor to "star" connection in the event of overload with automatic reversion to "delta" as soon as the overload is relieved.

Mooring Winches

This type of winch, though similar to a warping winch, has a fundamental difference in that the rope is fixed to the main barrel and is not operated off a warp-end. This type is becoming increasingly popular through the St. Lawrence Seaway requirements for vessels passing through the locks.

The motor must be capable of paying out or hauling in the mooring wire attached to the dock or lock side under rising and falling tide or draught conditions and must not fail whilst the operation is in progress. Winches for this duty fall into two main classes: one is for use while navigating the locks and is designed to stall for short periods; the other is for constant tensioning against rising and falling tides and rapid loading.

In the first class special slip-ring motors with torque limiting devices in the rotor circuit and Ward-Leonard drives with a weak field position to provide reduced torque on all steps of the controller are both used. In the second class rather more complex and expensive designs are necessary. One, the Almon Johnson (Fig. 3), incorporates an epicyclic gear between the drive and the drum, the outer barrel of which is friction coupled to a spring-loaded arm which carries contacts controlling the speed and direction of the motor. The spring is adjusted to maintain a required degree of cable tension any variation of which permits the contacts to close and either wind-in or wind-out the cable until the tension has again been restored. The friction coupling on the drum is adjustable by a handwheel and acts as a safety device against snatch or rises of tension faster than the drive can deal with, so preventing cable breakages.

Deck Cranes

Deck cranes with a.c. motor drives for hoist, luff and slew motions are also available from both British and continental makers. Ward-Leonard control is generally used for all three motions, though straight squirrel-cage motors are occasionally to be found on the luffing drive. Fig. 4 shows a typical modern British design which is predominantly of tubular construction giving maximum strength- and stiffness-to-weight ratios. They are available with three types of fixing: as a traveller, mounted on a carriage running on athwartship tracks; a fixed type securely anchored against overturning by a tubular post passing through two deck levels; and as a fixed type on a baseplate bolted to the ship's deck.

Ward-Leonard control is ideally suited for crane usage since it combines smooth regulation at all speeds with regenerative braking which, in the slew motion, is switched in from high to low stops progressively thereby reducing pendulation effects from the swinging load. Magnetic brakes which automatically bring all movement to a stop should the supply fail are fitted to all motions.

Windlasses and Anchor Capstans

Both of these forms of anchor gear are classed as "Essential Services" and must be fully operative and in first class condition before a ship is allowed to sail. Their function is primarily that of hauling in and securing the anchors from the sea bed prior to leaving the anchorage, with the corresponding function of releasing them under gravity when anchoring, or to warp the ship alongside a quay against the pull of wind or tide.

The heaviest duty is, of course, that of hauling in the anchors with their attendant chain the amount of which will vary with weather conditions and depth of water. It can be as much as nine shackle lengths—a shackle length is 15 fathoms (90 ft)—or over 800 ft of heavy chain plus the weight of the anchor plus any additional load imposed by "breaking out" the anchor from the sea-bed. The normal design figure is based on heaving both anchors simultaneously from a minimum depth of 30 fathoms at a speed of 30 ft/min. A long haul may, therefore, take anything up to half an hour of continuous motoring and the speed regulation must be such as to ensure close and careful control particularly at the last stages when the anchors are "stowed" in the hawse-pipes.

Though Ward-Leonard control, squirrel-cage and slip-ring induction motors have all been used with success, the type of duty favours the use of Ward-Leonard control with a rising characteristic giving a regulation similar to that of a steam driven windlass. It is, therefore, fortunate that Ward-Leonard control for windlasses has already been used for many years on d.c. ships as an alternative to steam driven capstans and all that has happened on the a.c. ships is that the Ward-Leonard generator is driven by an a.c. instead of a d.c. motor.

For those who do not favour the use of commutators and slip-rings on deck motor equipment, pole-changing motors have been used with a degree of success. Torque limiting features are usually standard on these drives for windlass and capstan duty, the operative device being a relay which selects either a different tapping on the stator winding as the motor approaches the overload condition and/or changes the connections from delta to star, the operation being entirely automatic and self-resetting.

Finally, experience has shown that claimed deck auxiliary requirements must be examined very carefully to see if they have been influenced by past history, commencing with steam and followed by d.c. supply, before deciding that they are really essential in an a.c. installation.

REFERENCE

1. B. Fox and H. C. Coleman: "Alternating Current for Auxiliary Plants of Merchant Vessels." Society of Naval Architects and Marine Engineers, New York, 1946.

E.R.A. plans and progress

RESEARCH ACTIVITIES IN 1959 REVIEWED IN REPORT

EXPANDING work in expanding premises is the story told in the annual statement by the chairman of the Electrical Research Association to members yesterday. In 1959, the Association had an income of £485,579, the highest ever, and some 5% greater than in 1958. Yet spending exceeds this figure by £13,335. Why this should be so is suggested by the record of a widening range of researches which fills the greater part of the annual report of the Association, summarised later in this article.

At the a.g.m. the chairman, Mr O. W. Humphreys, spoke of an overhaul that had been carried out in the committee structure of the ERA. Instead of 20 sectional committees overseeing research work, there is to be a much smaller number of "divisional committees", manned by high-level representatives of members who "not only know the basic general research needs of the industry, but are also in a position to ensure the provision of funds to support those researches." The new committee scheme is planned for operation early in 1961. It has amongst its objects the provision of more flexibility in planning programmes, and a speed-up in the disclosure to members of the results of research.

Mr Humphreys tackled the criticisms, sometimes heard, of the danger of overlapping between the expanding research organisation of the supply industry and the ERA, in welcoming the former as providing stimulating competition for ERA staff. He felt that contact between all concerned was so good that any danger of wasteful overlapping could be regarded as quite small.

An important dual-building project which has gone forward well has been construction of a new creep laboratory, with which is being incorporated an office building that will permit the Association to dispose of Thorncroft Manor. Consideration is now being given to moving to Leatherhead the high power section of the ERA.

This report of the chairman's speech began with a reference to finance. Before the research activities of the Association are considered there is one further aspect of finance that merits attention: an analysis of income in terms of its sources. The one constantly increasing category has been that accounted for by income from specially supported researches and specific research contracts. In 1959, this reached 37% of total income, compared with 14% in 1950. Income from subscriptions was 43% of the total, and that from government grant 20% (33% in 1950).

In covering the research activities of the Association, selection has to be the order of the day, for they range widely over the whole field of electrical engineering.

Insulation and Dielectrics

Amongst achievements in the continued attention to specific materials and processes has been improvement of the small-coil technique for determining the moisture resistance of impregnating varnishes. A coil test for impregnation and bonding properties of impregnating varnishes is under consideration. Currently in hand is an investigation into the coil winding properties of enamelled wires. Basic reviews undertaken include consideration of the behaviour demanded from any new insulating material to be used in transformer windings, and a critical resumé of all test methods specified in British Standards for electrical insulating materials.

One of the important extra-mural activities supported by the ERA is a three-part fundamental investigation into the oxidation of transformer oils. This is being carried out at the universities of Liverpool and Birmingham and at the Manchester College of Science and Technology. The Association has been tackling the problem of impregnating capacitors built up from plastic foil. This has proved unexpectedly difficult owing to the strong adhesion between the smooth foils which is so effective that air cannot be evacuated from between the foils. Efforts are being made to emboss film to reduce this effect.

Switch and Control Gear

After a lapse of some years, a new start has been made in work on oil-blast circuit-breakers. There are two main objectives: to trace the location and movement of the arcing column during the arcing period and to determine where arc reignition takes place after current zero. Up to the present, concentration has been on the difficult experimental techniques involved.

The Association has been devoting considerable attention to vacuum switching. The report comments that the practical construction of a vacuum contactor is largely a question of reducing the loss of arcing or "active" electrode metal to a minimum. This resolves into a problem of finding suitable pairs of metals for the active and passive electrodes comprising the contactor contacts. "Very significant" progress is claimed in respect of molybdenum passive and nickel-tin active electrodes. Another aspect of work on vacuum switches has been an investigation on behalf of AERE Harwell on the possible use of such switches for interruption of direct currents.

One side result of circuit-breaker research has been the evolution of a theory to explain the "plasma torch." This is a jet of very high temperature gas produced by blowing the plasma of a d.c. arc through a small nozzle. This jet is used for melting and cutting materials, or for spraying metallic or ceramic coatings on other materials, and is finding widening applications in industry.

Work on contactors has reached the stage at which there is hope that it will be possible to predict the contact life of different designs, from the results of a few simple measurements.

Cables and Lines

Last year's exceptionally dry summer gave good opportunities for assessing soil thermal resistivities under the worst conditions. Special backfills for cables have been found to give good results although the search for a backfill that can be accepted as entirely satisfactory continues.

For evaluating soil from the aspect of cable circuit design, a soil classification scheme has been approved, and attention is now being given to the extent to which its use can be improved by training and experience.

A new investigation aims at determining the factors which influence the short-circuit rating of p.v.c.-insulated cables and joints.

Economy in the design of distribution lines on wood poles is the object of an investigation which has been started at Pevensey, where experimental lines are provided with instrumentation that will record wind-induced vibrations. Steel tower foundations are being investigated with reference to resistance to uplift, and attention is being given to the influence of wind loading on tower design.

Surge phenomena work has covered an investigation into the impulse characteristics of wooden samples. The report comments that an ERA surge filter installed in a terminal 33 kV substation, connected to an unearthed wood-pole line in the East Midlands, operated seven times successfully last summer. It is suggested that this should serve to draw attention to a valuable and somewhat overlooked ERA development which might have wider application in the present day than it had when first introduced just after the war. The ERA's lightning flash counter has been in demand, it has been slightly modified to act as a thunderstorm warning device in places where hazards are particularly great.

Machines and Installations

An investigation has been started into the effect on noise emitted by transformers, of variations in thickness of laminations, permeability and other factors. It is hoped to make a further study of the causes of transverse vibrations in laminations by use of alloys with very low magnetostriction. Other work on transformers has been concerned with the mechanical properties of copper, with reference to mechanical forces in transformers.

The Association's new test vessel for determining safe gaps for flameproof enclosures is reported to have proved "entirely satisfactory" in use, and two more vessels are being constructed. Work is tending to show that FLP enclosures may be practicable for some of the gases at present excluded from BS 229. There has been attention as well to the use of gaskets to prevent external ignition, and the results are encouraging.

In the wider field of application of electrical equipment, an investigation has been started to develop a method of objective assessment of the annoyance value of irregular voltage fluctuation in lamps, television receivers and electronic instruments. The thinking behind this is that the cost of installations to supply arc furnaces, mine winders, electric railways and the like is affected by the extent of precautions needed to reduce to tolerable level the voltage fluctuations generated. Figures are available for regular flicker of lamps, but not for irregular variations.

Other Researches

Rural electrification work continued over a wide range of topics, covering livestock, horticulture, and crops. Wind power has continued to receive attention as well, with concentration on installations in the Isle of Man. Work has been started on a broader programme of investigation into the effects of wind pressure on tall structures.

Work of the ERA on thermal storage methods for heating buildings was reviewed extensively in the ELECTRICAL TIMES recently and it is mentioned in the present report. Basic data derived from tests under controlled conditions are being used to interpret results of tests in occupied premises, including large blocks of flats and maisonnettes.

Even this account does not touch on all the work of the ERA in 1959; welding, steam conditions and creep; communications interference are amongst other items which would merit attention were not space so pressing.

Consumer Safety

THERE should be early legislation empowering a minister of the Crown to prohibit by regulations the sale, letting on hire or hire-purchase of goods specified in the regulations that do not comply with the requirements for safety they specify. That is the principal recommendation of the Molony Committee* on consumer protection in an interim report published last week. The committee says "with personal safety at stake, legislative interference is called for."

Regulations made under the powers suggested might cover composition, design, construction and performance, and also the fixing, in a prescribed manner, of warning or operating instructions. Substantial penalties are recommended for infringement of such regulations, which should be enforced by local authorities. The committee does not recommend that exhibition of any certification mark should be part of the requirements imposed by regulations.

Compulsion for approval testing of products has been considered by the committee but rejected; it is felt that such schemes could give little, if any, greater protection than the arrangements proposed, and that they would involve far greater inconvenience and expense for all concerned.

The committee has paid close attention to electrical appliances and fittings from the safety aspect, and it notes that most accidents with them result from gross misuse, carelessness or inexpert tinkering. However, it rejects suggestions that there should be interference to make cables and accessories less easily accessible to the handyman; "the hazards which may require attention lie more in the apparatus and its connection with the installations."

Deep concern is expressed with the danger from imported appliances having flexible cord cores with colours misleading with respect to British practice. It is suggested that there should be prohibition of the sales of such equipment. Concern is also expressed about electric blankets, in respect of fire hazard. The suggestion is that warning notices about the dangers of local overheating should be attached to the blankets permanently; while if blankets are marketed appreciably below the BS standards, "that would cause appreciable concern." Small appliances such as toasters and fires and Christmas tree lighting sets have been considered as well, but in general the committee found observance of provision of reasonable insulation and construction to guard against access to live parts.

The report notes that trouble from electricity is not great. Both the supply industry and the manufacturers are praised for their "jealous concern for the safety of their products." A final note in the electrical section points to the advantage of complete standardisation of domestic plugs, partly because it would permit manufacturers to supply appliances with the plugs permanently and correctly attached and so avoid incorrect connection.

* The present report is published by HMSO, price 1s; it was noted briefly in last week's ELECTRICAL TIMES.

Mechanising production of discharge lamps

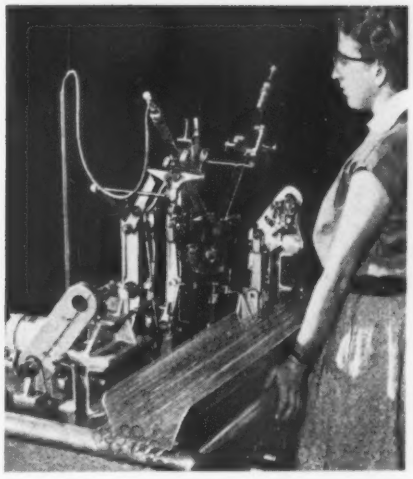


Fig. 1. This automatic machine bends the U-tubes which form the inner arc tubes for sodium lamps

LIGHT output of fluorescent lamps has increased steadily over the last twenty years, and shows little sign of having reached a maximum value. This steady rise has been notable for two sharp increases, the first in 1944/46 when beryllium phosphor coatings were replaced by halophosphates, and now in 1960 with the introduction of phosphor particle size grading.

By limiting the tube-internal-coating particle size to 20 microns, and rejecting all particles finer than 2 microns, an improvement in light output of the order of 15% is obtained, so raising the output of, for example, an 80 W daylight tube from 56 to 64 lumens/watt. Particle classification to this end is one of the new stages in discharge lamp production which we were able to see on a recent visit to the GEC lamp factory at Shaw (Manchester).

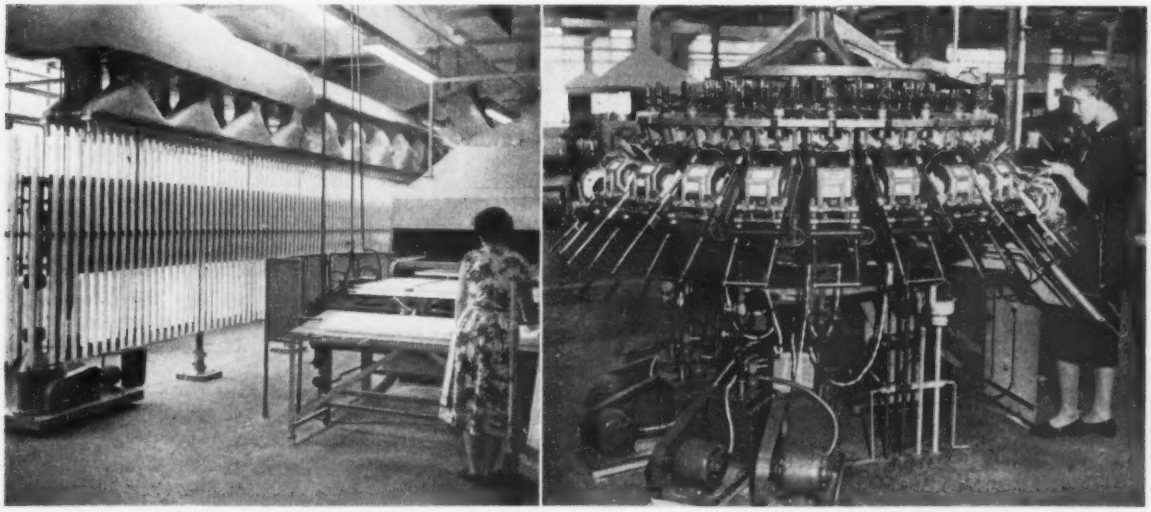
Water-soluble Binder

Another notable advance is the use of a water-soluble binder for attaching the phosphor coating to the tube wall. This coating will eventually replace the inflammable nitro-cellulose binder now in general use. New developments are not confined to fluorescent lamps, for in the production of sodium and mercury discharge lamps several processes carried out by skilled operators are now being performed by machines and yielding an increased production rate.

In 1948 the company converted to discharge lamp production an old cotton mill, taken over during the war for valve manufacture. Today there are over 1,100 employees, mostly women, engaged on production of discharge lamps and also decorative and automobile lamps.

Use of classified particles for the phosphor coatings is at present confined to 5 ft tubes in the three high efficiency colours. On arrival at the factory, phosphors are milled to give the required particle size and passed into a water mixing tank along a vibrating conveyor. From this mixing tank the particles are carried to the first of two conical centrifuges, entering them axially under pressure. The input pressure creates a swirling action separating the coarse and fine particles. Coarse particles from the first centrifuge enter a settling tank for regrinding. The fine particles enter the second centrifuge where they are again separated. In the second centrifuge the coarse particles are those suitable for tube coating, while the fines are too small and are ejected to waste. About 15% of the original mix is too fine to be used and it is this proportion which reduces light output of a lamp.

The classified particles, mixed with water and the recently developed soluble binder, are injected into groups of vertically mounted glass tubes which will form the fluorescent lamp envelopes. Although the water soluble binder is a more readily handled and safer material than the nitro-cellulose previously used, and it is less likely to give a residual carbon content in the tube coating, it has the disadvantage of requiring a considerable quantity of heat for drying. On the other hand, with the new binder



Figs. 2 and 3. On the left is shown the new automatic unit for drying the phosphor coating on fluorescent tubes. Hot air from the overhead duct dries out the water soluble binder. On the right is the rotary pump for mercury vapour lamps with its 24 heads each equipped with a muffle furnace and special electromagnetic valve for introducing the mercury into the lamp envelope, seen at GEC works

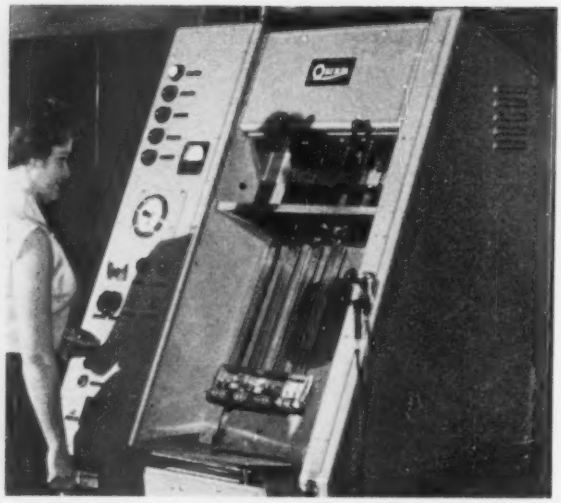


Fig. 4. Starting the cycle on an automatic evacuating and filling machine for sodium lamps. This machine controls the baking pumping and filling schedule in accordance with a timed programme

particles can be used direct from the centrifuge without drying and possible caking. Tubes are drained at a pre-set rate to give a uniform coating and then dried on a long conveyor by blowing hot air down them through a series of ducts. After air drying, the tubes enter a conveyor oven where the coating is baked. Subsequent processes for sealing the tubes, fitting the filaments and sealing on the end caps are performed on conventional machines.

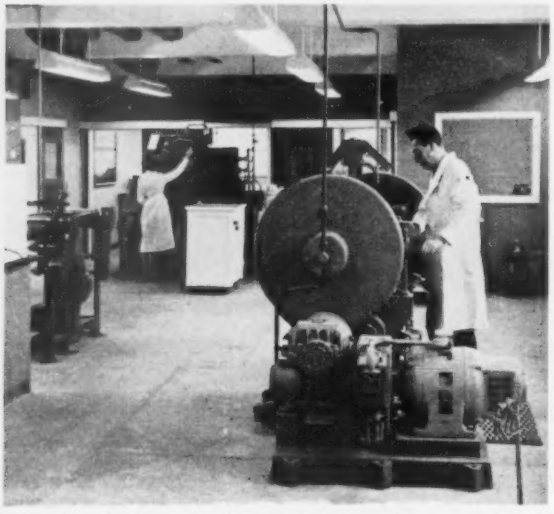
Emphasis at Shaw is on increasing mechanisation of production methods for sodium and discharge lamps, although development work on new sodium resistant glasses and the problems of overcoming sodium migration are also proceeding. Mercury lamps are now being made using the latest type of quartz pinching machines which seal the electrodes into the lamp envelope at a rate of up to 30 per hour.

An important introduction is a rotary pumping machine developed for the low wattage lamps and claimed to be the first of its kind in Europe. Previously, lamps have been exhausted on bench pumps. The new machine has 24 heads and it is expected to give a production rate of 120 to 200 per hour when it is in full use, compared with rates of 30 per hour produced by the bench method. Vital to the machine are the electromagnetically operated valves which inject an accurately weighed pellet of mercury into the lamp envelope when the required conditions of temperature and vacuum have been attained. Each machine head consists of a gas-heated muffle furnace which raises the quartz lamp bulb to working temperature. While the table rotates the bulb is evacuated, then flushed with argon and the mercury injected before the envelope is sealed.

Similar automatic sealing techniques, although not using rotary machines, are in use for sealing sodium lamps. These machines evacuate the lamp, introduce weighed quantities of sodium, and seal the envelope in batches of four under automatic time and sequence control. The U-tubes forming the inner envelope of the sodium lamps are now being formed on a machine which can produce about three times the number of units that a skilled glass blower could make in the same time.

PROGRESS IN SILICONES

PROGRESS in developing silicone products occurs at least as rapidly as in conventional organic chemistry. Quite apart from the need to evolve new products and methods of production, there is constant demand for technical service to users, either in producing new materials meeting their special requirements, or in dealing with problems which utilisation of the products may present. To this end, Midland Silicones Ltd. have recently added considerably to their laboratory facilities at their works at Barry, as part of a major capital construction programme which also includes a new silicone rubber production building and a number of pilot plants.



Technical Service Department's rubber laboratory at Barry, showing the two-roll mill in foreground and cloth-coating calender in rear

Technical service covers techniques, formulating and processing, practical demonstrations and investigations of special problems; it may involve adapting products to fit into a customer's production schedules or overcoming difficulties on site. One laboratory is devoted specifically to electrical applications.

Recent work under study has been aimed at developing a more flexible armature bar insulation. In contrast to the usual method of winding the bar with silicone-impregnated glass-cloth (in sheet or tape form), they have found that for long bars, it is more satisfactory to wind the bar with plain glass-cloth and apply a coating of cold-cure rubber. The rubber is secured to the cloth by compressing the bar between formers which gives a smooth finish. Apart from following flexing of the bar, this form of insulation also avoids any tendency for cracking at the corners of the bar.

The new rubber plant which has been laid down follows conventional rubber processing practice reasonably closely. The raw material (a silicone gum) is mixed with a powdered silica filler in a straightforward dough mixing machine; the resulting material is passed to one of the two mills where the curing agent is added. These mills are of the two-roll type, but differ from those used for conventional rubber only in that the forward roll rotates at about 25% lower speed than the rear roll. One of the mills is 48 in. wide and is driven by a 75 h.p. screen-protected motor; the other is 36 in. wide and is driven by 50 h.p. motor.

NOTES ON WIRING

BY MEGOHM

IN my recent review of the Electrical Exhibition I refrained from commenting upon the new pull switches which were on show on several stands. I did this purposely to give myself time to look into the matter of pull switches generally because of the rather mixed reception this accessory receives from planners and users. One significant development has taken place in the construction of this type of switch during the last year and is that most of them can be operated from an angle of 45°. This means that the switch can be mounted on the wall instead of the ceiling, but the reasons for such a development are, to me, just a little vague. Various reasons can be put forward ranging from the desire to do away with a cord from the ceiling to the fact that some switches were damaged by not pulling the cord down in a line with the switch.

Normally we find pull switches in bathrooms and, as I have said before, I agree with the principle behind their use in such rooms, although I think they look untidy. A modern trend is to use them for the control of water heaters and immersion heaters and the type which incorporates a neon signal lamp is particularly suitable for such situations. Take another situation, seen recently in a nurses' hostel, where an annexe housing two bathrooms and three washbasins had a total of six lighting points, five pull switches and one wall switch. The partitions were only 6 ft high whilst the ceiling was 10 ft high. When I entered the area I was reminded of the balloon barrage which was so familiar to Londoners during the war. The room was only 12 ft by 12 ft and seemed to be absolutely full of flexible cords and switch cords. Here, I agree, the pull switches in question could be used to good effect by being mounted on the wall at partition height. By doing so, the spiders would not find it so easy to weave their webs between the hanging cords.

One exhibitor at the Exhibition had gone a step further than the others by adapting a switch, normally incorporated in the over-mirror bracket marketed by him, and mounting it in a square, shallow metal box. When held against the wall this was very neat and unobtrusive and I thought it to be a line worth cultivating. I suppose I could refer to pull switches as "a necessary evil" and would meet with opposition from those who consider them otherwise, but I stick to my opinion that, where at all possible, they should be eliminated.

Spring-cleaning and Lampholders

I wonder how many of my readers are in the same boat as a neighbour of mine was recently? He approached me one Saturday afternoon, red in the face and very agitated, and proceeded to explain that his good lady had started spring-cleaning! He had been torn away from his pleasures to remove the shades from the lighting points so that they, too, could be spring-cleaned. Alas! What appeared to be an easy task turned out to be more like a nightmare and resulted in broken shade rings, rude words and the complete divorce of accessory manufacturers from the human race. A quick look for the make of the holder—without success—and my friend was informed that if he bought holders of reputable manufacture his troubles would be cured.

This, of course, is an old problem but much has been done to eliminate the trouble and the latest BS 52 Supplement 1, which covers minimum standards for the performance of all b.c. lampholders of moulded insulated materials, assists further. Once more the new higher wattage lamp in its smaller size comes into the picture, as does the enclosed contemporary fitting with little or no ventilation. Heat generated by either or a combination of both these items can cause a locking of the shade rings. The Supplement calls for two points to be adhered to. The thread size of the skirt or sleeve is now standardised at 18 threads per inch and all lampholders should be able to withstand a temperature of 135°C. It is claimed that no lampholder manufactured in urea material will stand up to the test clause of the specification. One manufacturer has already put on the market a range of contemporary lampholders which come within this specification, and I trust that contractors and all concerned will make certain that their clients' blood pressure remains steady even during these bouts of spring-cleaning.

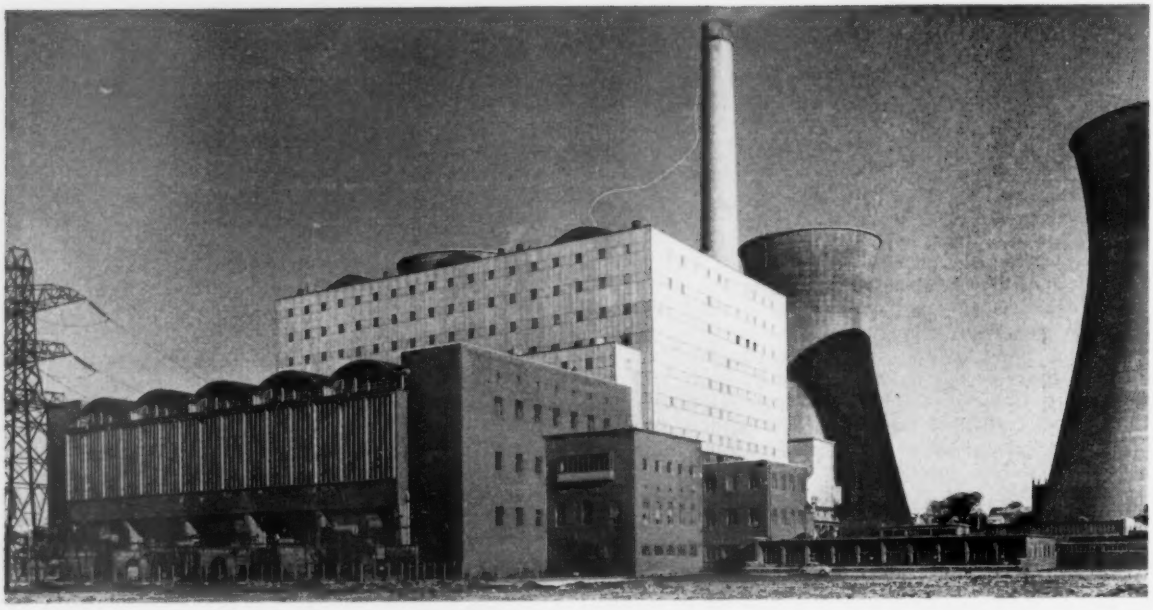
Safety in the Home

Everybody must have read, with interest, the reports in the popular Press dealing with the interim report of the Committee on Consumer Protection. One "danger" which was listed, and given prominence on the news on television, was the matter of foreign appliances with cables not coloured in accordance with the accepted British code. One suggestion put forward is that plugs and sockets should be completely standardised, which would not only add to the householder's convenience but allow manufacturers of apparatus *permanently* to attach a plug to their appliance. This, in my opinion, is an excellent idea but, I am afraid, rather a pipe-dream. Unless a law was passed not only for all future work but for *existing* installations to be changed I can see chaos in the industry.

One statement did rather hit me and this was the committee's remarks that "Do-it-Yourself Electricians" should NOT be hampered from buying cables and fittings! It was stated that some of them made a mess of the work but accidents were few and control would mean interference with careful and intelligent handymen. Quite frankly I don't agree with this at all. If a law is to be made, then make it that only qualified electricians and electrical engineers are allowed to carry out alterations, etc., to the wiring installations.

Electric blankets came in for some criticism but until I read the actual report I can't say much about these, except that I get a shock when I learn how some of my friends use them. They almost wear them for nightclothes.

I feel that this business of safety has been left too long and as this report covers many industries besides the electrical industry the problem is almost out of hand. The first measure that I think should be taken is tightening up about people who do electrical installations. Let them be registered, improve wiring installations and stop the amateur (by law if necessary).



Ferrybridge B — 300 MW Station

WITH three 100 MW sets installed and direct connection to the 275 kV transmission network, Ferrybridge B power station is an important unit in the Yorkshire Division of the CEGB. Its description in our pages marks its formal opening last Friday by Mr E. S. Booth, the member of the CEGB for engineering.

The supply industry has owned the Ferrybridge site since 1936, and there has been a station on an adjoining site since 1927. Although the site was once liable to flooding, it has been brought up to a safe level by the use of ash from the A station. From the fuel and cooling water aspect, the site offers many attractions. Road, rail and river access is possible, and the river bounding the site provides circulating water in good quantities, though cooling towers have been built to supplement the cooling capacity at times of low water availability. An extensive area of waste floodland to the north of the site provides a dumping ground for boiler ash.

Layout of the station is such that the three sets lie transversely to the unit boilers, giving a wide but compact turbine house. The massive boiler house is asbestos sheet clad, with small corrugated glass windows piercing the cladding to relieve the bulk. Over-all building volume has been kept down to 31 cu ft/kWi, and over-all cost of construction is about £49/kWi. Because of the geographical position of the station, transport charges are low, and although the coal burnt is of low calorific value (9,700 B.Th.U./lb), cost of fuel and handling is only about 0·315d/unit s.o.

Boiler Plant

In accordance with general practice, the station is constructed for unit operation and, despite having 100 MW sets, it incorporates a reheat cycle. Leading characteristics for the boilers and associated equipment are listed in Table 1. At full load, some 700 klb/hr of steam is reheated in each boiler, the balance of 60 klb/hr having been bled from the h.p. turbine for use in feed heating.

Each boiler takes its coal from a 1,250 ton capacity overhead bunker, with gravity feed to five pulverising mills; four mills can handle the boiler on full load. The mill motors are two-speed machines. There are 20 p.f. burners, supplemented by 12 oil burners for starting up.

Table 1. Boilers and Auxiliaries.

Rating	760 klb/hr
S.V. conditions	1,600 lb/sq in., 985°F
Reheat conditions	432 lb/sq in., 955°F
Combustion chamber volume ...	88,000 cu ft
Furnace heating surface	13,000 sq ft
Primary s'heater heating surface ...	20,140 sq ft
Secondary s'heater heating surface ...	16,130 sq ft
Radiant s'heater heating surface ...	4,250 sq ft
Reheater heating surface	34,530 sq ft
Economiser heating surface	28,000 sq ft
Air heater heating surface	267,000 sq ft
Pulverising mills	5 by 12 tons/hr
F.D. fans	2 at 127,000 c.f.m.
I.D. fans	2 at 217,000 c.f.m.

Each boiler has a single steam drum of 5¼ in. thick steel, 49 ft long by 66 in. i.d. A self-draining horizontal primary superheater and pendant secondary and radiant superheaters. Two spray-type, direct-contact attemperators are provided for each boiler. Reheat temperature is controlled by furnace dampers which by-pass the appropriate proportion of the furnace gases. Automatic control of boiler operation is provided over a limited range.

Boiler arrangement is unusual in one feature; the firing face is the side *remote* from the turbine house, although the air heaters are positioned beyond the firing face, against the outside wall of the station. Accordingly, a furnace gas duct has to run across the furnace basement from the economiser outlet to the air heater.

Ash and Dust

Ash falls from the boiler into a water-sealed ash hopper, whence it is sluiced by high-pressure jets to a sump in an ash house. Dust removed by the mechanical and electrostatic equipment also finds its way to this sump. From the sump, twin ash discharge lines convey an ash-water mixture to the disposal area already mentioned, which is about a mile away. The ash disposal plant is common to all three boiler units.

Turbo-alternators

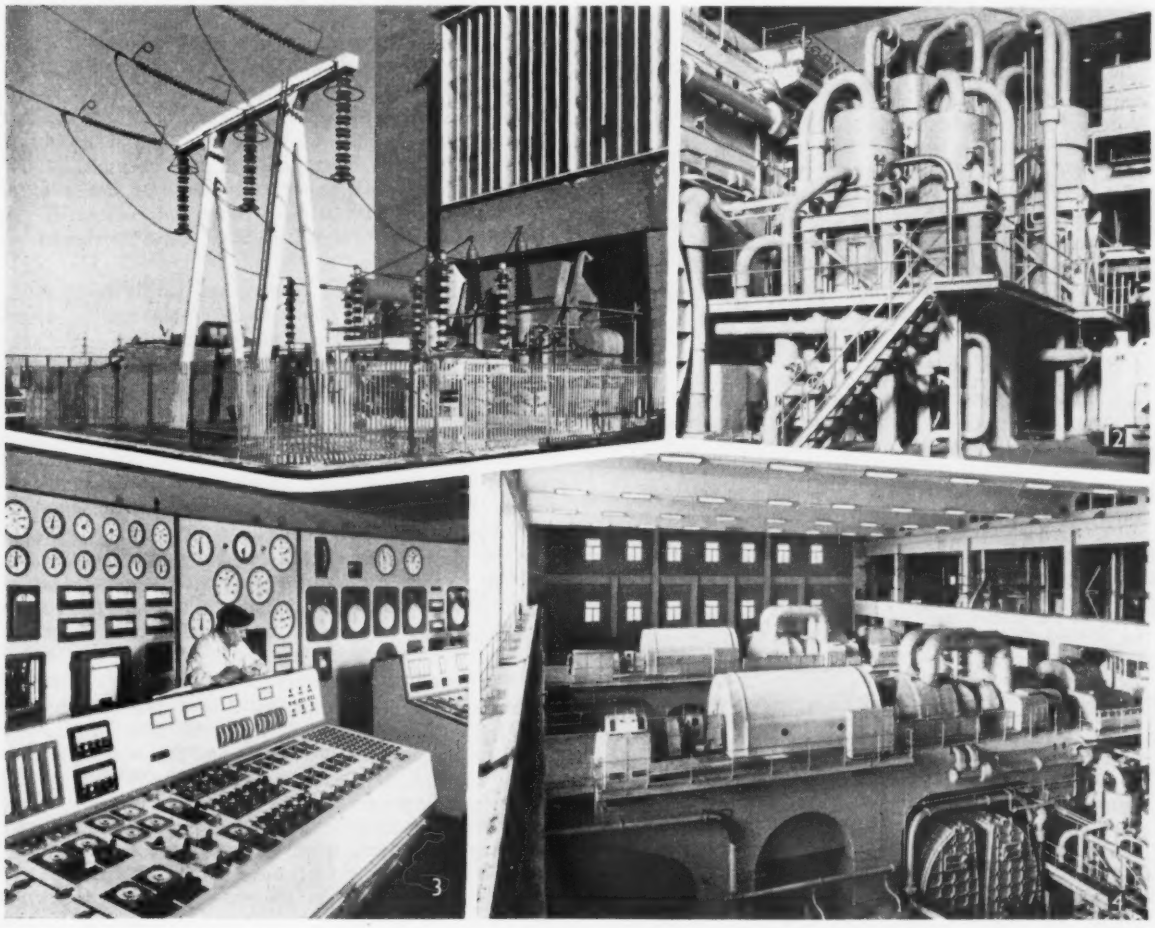
The 100 MW sets have turbines of three-cylinder design, with steam passing through the h.p. cylinder before returning to the boiler for reheating, and then entering a combined intermediate and low pressure cylinder. Part of the exhaust from the i.p. section passes to a double-flow l.p. cylinder, the remainder continues in the same cylinder through l.p. blading. All three l.p. sections exhaust into a common condenser. Table 2 gives the principal characteristics.

The h.p. cylinder is of double casing construction, to limit temperature gradients. It has two stages of impulse blading and ten of reaction blading, and about 25% of the total turbine power is produced in this section. The i.p. section of the turbine has 10 stages of reaction blading, and each l.p. section 27 stages. The combined i.p./l.p section of the turbine is responsible for 50% of the power output and the l.p. section for the remaining 25%. Steam for feed heating is bled from the turbine at six points.

Table 2. Turbo-alternators and Auxiliaries.

MCR rating	100 MW
TSV steam conditions	1,500 lb/sq in., 975°F
Final feed temperature	435°F.
Vacuum, c.m.r. at 30 in bar. ...	28·9 in.
Inlet cooling water temp. ...	60°F
Generation voltage	13·8 kV
Weight of stator	220 tons
Booster feed pumps	2 at 850 klb/hr, 540 lb/sq in.
Main feed pumps	2 at 850 klb/hr, 1,960 lb/sq in.
Evaporator capacity	25 klb/hr
Condenser surface area ...	75,000 sq ft
C.W. per condenser	64,000 g.p.m.
Extraction pumps	2×680 klb/hr

Use of the reheat cycle introduces some complication into turbine control, since it is no longer practicable to shut down the set merely by tripping the main stop valve. The amount of steam entrained in the reheat steam piping is sufficient to drive the turbine to over-speed if electrical load is lost. For this reason, intercept valves are provided to prevent reheated steam entering the machine, and the reheat pipework is provided with unloading valves to release the steam to atmosphere. Pressure for the control servo system is provided by gear-type oil pumps driven off the turbine shaft.



1, No. 3, 275 kV generator transformer and connections. 2, A feed heater group associated with one of the turbines. 3, No. 2 unit control room. 4, A general view of the turbine house from crane rail level; note the small windows, an architectural feature of Ferrybridge B

Alternators are hydrogen-cooled machines rated for 0·8 p.f. One set (No. 3) is designed for 10 lb/sq in. hydrogen pressure; the other two for 7·5 lb/sq in. Excitation current is provided from a d.c. generator gear-driven from the main shaft at 750 r.p.m. The machine consists of two generators combined, one acting as main and one as pilot exciter. Voltage regulation is by a normally inactive type equipment capable of holding voltage to ± 1% of controlled value throughout the output range.

Two of the generators are connected through 120 MVA transformers directly to the 132 kV substation in the power station grounds. No. 3 generator is connected through a transformer of similar rating to a 275 kV o.h. line connecting it with the Monk Fryston Supergrid switching station some two miles distant.

Table 3. Principal Motors.

Pulverising mills	150 h.p.	580 r.p.m.	415 V
PF pri. air fans	180 h.p.	1,460 r.p.m.	415 V
Boiler f.d. fans	270 h.p.	970 r.p.m.	6·6 kV
Boiler i.d. fans	406 h.p.	585 r.p.m.	6·6 kV
	770 h.p.	735 r.p.m.	6·6 kV
Ash handling, h.p. sluicing ...	250 h.p.	1,475 r.p.m.	415 V
Ash handling, disposal ...	190 h.p.	1,480 r.p.m.	415 V
Booster feed pumps	900 h.p.	1,470 r.p.m.	6·6 kV
Main feed pumps	2,650 h.p.	2,980 r.p.m.	6·6 kV
CW pumps	900 h.p.		6·6 kV
Cooling tower pumps ...	1,300 h.p.		6·6 kV

Feed Water System

Two 100% duty extraction pumps are provided for each condenser, with three 50% duty Le Blanc rotary air pumps and a separate starting exhauster. The feed heating chain consists of two l.p. heaters, a combined de-aerator and feed heater, two 100% duty booster pumps (Table 2) and then three h.p. heaters, with the main feed pumps (two of 100% duty) coming at the end of the chain before entry to the economiser. All the pump motors involved are operated from the station 6·6 kV auxiliaries supply, and are started simultaneously by direct-on switching.

Make-up water for the boilers is supplied by three double-effect evaporators, the water being subjected to prior conditioning in an ion-exchange plant.

Circulating Water

Circulating water comes from the River Aire, which adjoins the station. To avoid undue temperature rise when the river flow is low, three 3¼ million gallon/hour cooling towers have been installed. These are arranged between the c.w. inlet and outlet works, so that water returned to a tower may pass either to the pump side of the c.w. screens or to the outfall. Specially designed balanced-reel screens are used for filtering the river water for small trash. These have been developed by the CEGB Northern Project Group and are claimed to provide unusually clean water.

Principal Contractors, etc.

Station engineering: CEGB (Northern Project Group, Mr W. H. C. Pilling, chief project engineer, Mr A. J. Hodgkinson, project engineer).

Mechanical engineering: boilers, Babcock and Wilcox; turbo-alternators, C. A. Parsons; feed heating and condensing plant, C. A. Parsons; coal handling plant, Mitchell Engineering; ash and dust handling plant, John Thompson Indl. Constructions; HP pipework, Stewarts and Lloyds; feed pumps and motors, Harland Engineering.

Electrical engineering: generator transformer, C. A. Parsons; station transformers, Fuller Electric; unit transformers, Yorkshire Electric Transformer Co.; 6·6 kV aux. swgr., South Wales Switchgear; 415 V aux. swgr., Brookhirst Switchgear; batteries and rectifiers, Pritchett and Gold and EPS; cables, BICC and Crompton Parkinson; 132 kV swgr., BTH (now AEI).

Control and Station Supplies

There is a unit control room for each boiler-turbine-generator at operating floor level between boiler and turbine. The station as a whole is operated from a main electrical control room, located in the administration block, but having windows looking both to the turbine hall and also to the outside of the station. Switching, synchronising and loading of generators is carried out from this control room.

Station auxiliary supplies are at 6·6 kV and 415 V. Each set is provided with a 10 MVA unit transformer and, in addition, there are two 10 MVA station transformers supplied from the 132 kV busbars. Table 3 gives the ratings of the principal motors.

Fuel Efficiency Still Important

CONCERN of the Ministry of Power with fuel efficiency is as great today as it was in the worst days of fuel shortage. This was stated by Mr R. Wood, M.P., Minister of Power, at the annual luncheon of the Institute of Fuel last week. Mr Wood was replying to the toast of The Guests and said that as Minister he was co-ordinator and, he hoped, helpful observer of the fuel and power industry. The Minister saw the industry from a central position, although one outside it. Since he had been at the Ministry of Power he had been much impressed by the magnitude of the decisions which executives in the fuel and power industries had to take. The Institute of Fuel help all concerned because of the way in which it brought together those interested in different fuels.

Mr Wood commented that he had hardly taken office in the Ministry before demands were made on him about a national fuel policy. He considered that the Government had a national fuel policy. It was to provide Britain's fuel needs as cheaply as possible. The Government thought that this could be achieved best by giving freedom of choice. If the Government were to lay down certain rules for the use of fuel, then that might be convenient for some people for a short time, but it would not last. Britain was too dependent on overseas trade for any risks to be taken in reducing competitive power.

Mr Wood commented that the coal industry was fighting hard to restore its fortunes and with a good deal of success. He was sure that the answer for coal was not to restrict the use of oil, but for the NCB to increase the efficiency of production and to provide a good technical service for industry.

The toast of The Guests had been proposed by the president of the Institution, Mr A. C. Monkhouse, who also awarded the Students' Medal and Prize of the Institution to G. E. Oatley, B.SC., and the Bone-Wheeler Medal to Dr R. H. Essenhigh. In the annual report of the Institution, presented to the annual meeting held before the annual luncheon, there was comment on the rate of growth of membership of the Institute which, with the net increase of 214 over the year, almost matched the highest figure previously achieved. Membership is now 5,217, and the Council is optimistic that it will continue to grow steadily.

Automatic component testing

PUNCHED TAPE PROGRAMMING FOR NEW MACHINE

AUTOMATIC assembly of electronic components on printed circuit boards is a recent development now gaining wider popularity in view of the general availability of transistors and the simplification which these devices permit. In a usual arrangement, components are held in magazines from which they are taken sequentially for assembly on the board, their end wires being inserted in holes in the board and bent over onto the copper surface. It will be appreciated should an incorrect component be inserted, location and correction of the fault is both time consuming and expensive.

To guard against such possibilities, an automatic component testing machine, described at a meeting last week of the IEE Measurement and Control Section,* has recently been developed at British Telecommunications Research. The machine has been arranged for incorporation into the assembly line to check components immediately before assembly. It is a programmed machine, in which the testing sequence forms part of the programme, and uses simple transistor circuits, arranged to give maximum flexibility in utilisation.

Machine Arrangement

The machine is designed to handle axial-lead components, which are mounted in vertical magazines standing in a framework which comprises the component store. By means of solenoid-operated release mechanisms, components are allowed to drop from the store on to a conveyor bar, along which they are propelled by air jets to the test station. Here the component is brought to rest at the required position using a photo-electric system. Test clips grip the component wires to connect the component to the test bridge; the electrical test is carried out and the component is passed or rejected as appropriate.

The associated electronic circuits are mounted in small, printed-wiring boards which slide into shelves in a nearby cubicle. The programme is fed into the equipment by means of five-track punched tape sensed by a step-by-step reader presenting one character at a time. The programme gives information on magazine numbers, component type, value and tolerance, these being punched in blocks of characters which start with an identifying character and finish with an end-of-block character which resets the control system in readiness for the next block.

The identifying prefix is used to route following information to appropriate parts of the machine. Blocks giving magazine numbers, component values and similar information which may be required for some time are stored. Timing of all operations is controlled by an electronic clock comprising a ring of monostable circuits which respond to an input pulse and then reset themselves into their original state. For storage purposes, bistable circuits are used, feeding into sealed reed relays which carry out the switching involved to set a required bridge into the test circuit. Pass and reject traps are operated by solenoids; detection of the presence of a component is by photo-transistors. When a component is rejected, the control calls up a second component according to the information still stored in the magazine-number store and repeats the test cycle. When a component is passed, the control cancels all stored information and steps the tape on to the next position.

The transport system limits the size of components; here the machine is capable of handling $\frac{1}{4}$ W resistors and larger and paper capacitors up to 0·25 μF. The capacitance bridge makes use of standard capacitors arranged in binary decades, each having a reed relay; the resistance bridge makes use of a series chain of resistors with switches across them. Values catered for range from 100Ω to 100kΩ, and 0·001 μF to 10μF.

Time taken to carry out a component test is of the order of a few milliseconds, and consists mainly of the time required for the clips to grip the component. The main restriction is in the time taken to transport components, which limits the size of the store. Reliability is high, at the cost of the occasional rejection of a good component as a result of bad contact due to dirt on the component wires.

DISCUSSION

MR F. G. SWIFT (STC) pointed out that the true virtue of a printed-wiring board lay in its promoting a new form of assembly. The new assembly form opened the way to a radical change in the whole conception of design, manufacture, inspection, production control, presentation of engineering information, ordering, stocktaking and the accountancy, which could all now be integrated by common-based data. The gains stemming from such an integrated manufacture were very considerable compared with those due to a printed wiring considered only as an alternative form of wiring. In just one aspect, the production of engineering information, two dimensional printed wiring boards designed for automatic component insertion demanded the adoption of modular principles of layout. So long as the co-ordinate points could be defined in modular increments, then accurately dimensioned drafting was not required.

MR W. FORDHAM COOPER suggested that careful though had to be given to the question of fault-finding and tracking back with such complicated techniques. If the person who operated the "typewriter" punching the tape made a slight error, it might lead to a great deal of trouble at a subsequent date to ascertain just what was wrong.

DR J. K. WEBB (STL) pointed out that it was necessary to cope with human errors, but they had been coped with successfully in data processing systems. Girl operators were usually employed to punch the tape and to check, and statistics had shown that the average error rate was 0·003%.

DR J. A. SARGROVE showed a film of automatic component testing equipment built in 1954 for 1,000 components.

* Paper No. 3219, by T. C. Cardwell, B.SC.(ENG.), GRADUATE I.E.E.; J. R. W. Smith, M.SC., A.INST.P.; G. H. King, B.SC., A.M.I.E.E.

OVERSEAS NEWS

from our correspondents abroad

CANADA

Calgary's Expansion

During 1959 Calgary Power Ltd. sold 1,848 million units, an increase of 264 million over the previous year. This compares with an average rate of load growth over the past 20 years of 13·6% per annum, Mr G. A. Gaherty, the president, has reported. Last September agreement was reached with the City of Calgary for a contract covering the city's entire power requirements up to 300 MW. This contract extends to 31 Aug., 1973, with purchase from the company of power in excess of this amount being subject to further negotiation, and at the option of the city. During 1959, the city's maximum demand for power was 139 MW. No new plant was commissioned during 1959, but the planned expansion to the Spray and Rundle hydro plants totalling 80 MW will be completed by the autumn of 1960. A 150 MW unit at the Wabamun coal-fired power station is scheduled for completion late in 1962. A modified programme of development for the Brazeau project has been formulated so that 30% of the ultimate storage will be available for the alleviation of pollution in the North Saskatchewan River for the winter of 1962-63, and a smaller amount a year earlier. This programme would defer a large part of the cost of the reservoir for a number of years until the additional storage is required. The initial power will not be required until 1963, or later, so the construction of the power facilities need not be started for another year or more. To ensure the availability of stored water as soon as possible from the Brazeau project, preliminary work on the cofferdamming and unwatering of the site was started some months ago.

U.S.A.

Nuclear Station Operating

The Dresden nuclear power station, situated on the bank of the Illinois River, 50 miles south west of Chicago, has begun feeding electricity into the Commonwealth Edison Co.'s transmission system. The station has one 180 MW turbo-generator, but first output reached 64 MW and the rate is being stepped up gradually during the coming weeks, with testing done at various levels. Dresden, which is a light water moderated and cooled boiling water reactor, achieved its first nuclear chain-reaction last October, when the first 28 uranium fuel assemblies were installed in the reactor core. Since then, testing has been conducted as the core was loaded to the present 448 fuel assemblies in the initial stage. After being brought up to half-power the reactor will be shut down to check performance data. The station is expected to be in full operation this summer. Built by the US General Electric at a fixed price of $45 million, plus $51 million for site and overhead costs, it will be owned and operated by Commonwealth Edison, who have contributed $30 million towards the costs. A further $15 million is being provided by the Nuclear Power Group Inc., which consists of Commonwealth Edison, six other utilities and Bechtel Corporation, constructional engineers for the project.

HOLLAND

Electrical Exports

The Association of Factories in the Electrical Engineering Field in Holland (FOEGIN) has stated that in 1959 Dutch exports of electrical engineering products amounted to F1,010 million, compared to F853 million in 1958, an increase of over 18%. The goods exported in 1959 included radio and television sets and accessories (F522·1 million), switchgear and installation material (F121·0 million), lamps and tubes for lighting purposes (F96·5 million), household appliances, excluding vacuum cleaners (F87·0 million), electric motors, generators, converters, transformers, etc. (F37·9 million), wire and cables (F32·4 million), telephone and telegraph apparatus (F23·9 million), vacuum cleaners (F19·1 million) and electrical medical instruments (F18·9 million). Exports to the six European Economic Community countries were worth F365·9 million and to the seven Economic Free Trade Association countries F296·1 million. The most important buyers of electrical engineering products were Belgium and Luxemburg (F154·1 million), Western Germany (F140·7 million), Sweden (F93·6 million), Britain (F69·1 million), the USA (55·8 million), Denmark (F39·7 million), Italy (F35·9 million) and France (F35·2 million).

SWITZERLAND

Co-operation

Two prominent Swiss engineering concerns, Escher Wyss AG and the Maschinenfabrik Oerlikon have agreed to collaborate in the steam turbine, turbo-compressor and turbo-alternator fields. This integration and rationalisation is to cover experimental work, production and sales organisation, and has been decided upon in order to meet the possibility of increased competition arising from European economic integration. But it does not extend to other activities of the two companies.

RHODESIA

Second Set Ready

The second of six 100 MW generators at the Kariba hydro-electric project, Rhodesia, completed its trial tests last week. This machine will be formally set in operation by the Queen Mother at the official inauguration on 17 May. The first 100 MW set has been operating at about 70% of capacity since the middle of December.

S. AFRICA

Free Electricity

The Pretoria City Council has decided to supply electricity free of charge to firms desirous of floodlighting their buildings situated within a certain area in the main business part of the city. The premises concerned will have to be architecturally approved by the city engineer and the city electrical engineer. The supply of free current will be confined to Saturday evenings, public holidays and special occasions, and the estimated expenditure is put at £30 per building per annum. In addition, consideration is to be given to applications received for a free supply of electricity in respect of buildings situated outside the area proposed.

Avoiding Power Trouble

In order to counteract electricity supply difficulties such as resulted from the recent Coalbrook mine disaster, the Free State Chambers of Commerce, at a regional congress last week, urged the South African Government to undertake hydro-electric schemes. They referred specifically to the Ox Bow Lake scheme, North Basutoland (to which we referred on 13 Nov., 1958). It has been estimated that this scheme could provide 350 million units per annum at a cost of 0·34d per unit, in addition to water supplies. It is understood that the Basutoland authorities have almost completed their report on the scheme and are then expected to approach the Union Government on the matter.

INDIA

US Power Loan

A loan amounting to $73 million to India has been agreed by the USA to finance construction of a new thermal power station. The US Development Loan Fund will provide $30 million and the balance will be met from the proceeds of the sale of agricultural commodities supplied to India. The loan is for a 250 MW power station to be erected near Chandrapura, 200 miles west of Calcutta, in the area of the Damodar Valley Corporation. The agreement provides that the two 125 MW sets for the station will be supplied by American firms, but the remainder of the equipment needed will be obtained through international tenders. The first machine is scheduled to be completed by the end of 1962 and the second, three months later. This will be the largest Indo-American economic project to be financed entirely with US assistance.

Controlled Production

Many electrical items are represented in a list of 49 industries which the Ministry of Commerce and Industry in India has named, for which licences for the setting up of fresh production capacity will be issued freely. The list includes boilers and steam generating plant, transmission towers, switchgear, electrical instruments and insulators. The Ministry has also issued another list of industries where it has been decided not to sanction fresh production capacity. This includes conduit tubing, general lighting lamps, lighting fittings, wiring accessories, domestic refrigerators, air-conditioners, torches, distribution transformers, three-phase induction motors, squirrel-cage motors up to 20 h.p. (except special types), and electrical stampings.

AUSTRALIA

Snowy Speed-up?

New plans have been prepared for expediting the completion of the Snowy River irrigation and power scheme. Adoption of these new proposals, however, depends upon the availability of the necessary funds. Providing finance is obtainable, construction of the first phase of the scheme to link the Snowy and Murray rivers by a series of tunnels under the Australian Alps will begin this year. Under the new proposals the tunnels would be constructed at higher levels than was originally proposed. The Snowy-Murray section is to have several stations, the first of which, with a capacity of about 910 MW, will be the largest in the entire scheme, and the section will provide the greatest aggregate output.

H.V. Laboratory

A new high voltage laboratory at the University of Queensland was officially opened earlier this month by the State Premier, Mr Nicklin. The building itself has cost £35,000 and houses equipment valued at £43,000. It is under the control of Prof S. A. Prentice, who has just been named as a member of the Electrical Research Board.

JAPAN

Pumped-storage Plant

A contract for a 69,000 h.p. reversible pump turbine has been placed with Allis-Chalmers International by the Chubu Electric Power Co., of Japan. This is to be installed in the latter's new Hatagani power station. The associated generator is to be supplied by the Fuji-Denki Co., of Japan.

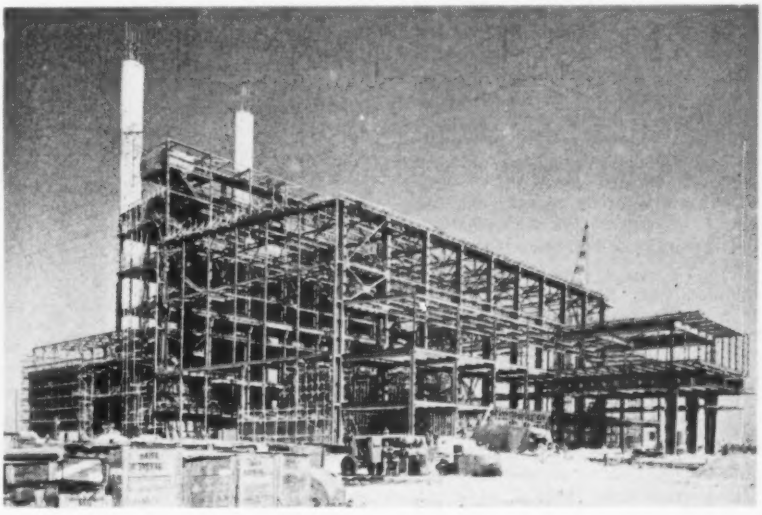
New 150 MW Power Station in Israel

THE Palestine Electric Corporation, which is the public supplier of electricity throughout Israel, is now erecting a new steam power station in the north of that country. This station will house two reheat generating sets of 75 MW each on the unit system, each set comprising a water-tube boiler of 550 klb/hr evaporative capacity; a 3,000 r.p.m. 75 MW turbine driving a 100 MVA hydrogen-cooled generator (the largest yet installed in Israel); and a 100 MVA main power transformer. The various installations will include a fuel oil delivery and storage installation, water-treatment plant and cooling-water plant, as well as the usual condensing and feed-heating equipment, auxiliary transformers, h.v. and l.v. switchgear, measuring instruments and control equipment. Demineralised water will be used for make-up. Each unit will be supervised from an air-conditioned control room fitted with all equipment for measuring, automatic and remote control. Three men per shift will be required for each unit.

Steam pressure and temperature at the t.s.v. will be 1,800 lb/sq in. g. and 1,000°F, with reheat to 1,000°F. Boilers will be fired by heavy fuel oil and it is expected that consumption of fuel oil (of 17,300 B.Th.U./lb L.H.V.) will be at the rate of 0·550 lb per unit generated (at a condenser cooling water inlet temperature of 90°F) giving a thermal efficiency of over 35%. Burner flames and water level in each boiler will be supervised by closed-circuit television from the unit control room. The generation voltage, 13·2 kV, will be stepped up to 110 kV for feeding into the national grid. Steam condenser cooling will be effected by sea water at the rate of some 110,000 Imp. gall/min. The power station building, occupying an area of 1½ acres, is shown below.

The boiler house has an overall height of about 138 ft from ground level. The twin reinforced concrete, brick-lined chimneys, with an outer diameter of 14·7 ft, are over 260 ft high. The station will have a fast 750 Kg. lift and a goods lift of five-ton capacity. Work on the new power station was started at the end of 1958. It is expected that the first 75 MW unit will be commissioned by the end of this year and the second unit in the autumn of 1961.

The overall design of the power station, the procurement of plant, equipment and materials and the erection of the steel structure of the station itself, have all been carried out by the Palestine Electric Corporation's own engineering staff or under their supervision. The installation of the plant, too, is being supervised or executed by the Corporation's technical staff. Upon completion of the station, Israel's generating capacity will increase from the present 410 MW to 560 MW.



Personalities *in the industry*

District manager of the Essex Suburban district of the London Electricity Board, **Mr J. R. Kinnersley,** M.I.E.E., has been promoted to management officer, responsible for the south western quarter of the board's area. (*ESH, pages 76 and 79.) Educated at West Ham and East Ham Municipal Technical Colleges, Mr Kinnersley entered the industry with the West Ham Corporation Electricity Department holding various posts, and becoming superintendent of the Consumers' Department in 1942, a position he held until 1948. With the LEB he became commercial officer to the North East sub-area until 1957, when with the board's change to two-tier organisation, he was appointed manager of the Essex Suburban district.

Sir Ronald German, C.M.G., has been appointed Director-General of the Post Office from 1 June in succession to **Sir Gordon Radley,** K.C.B., C.B.E., B.SC., PH.D., M.I.E.E., who is retiring. **Mr W. A. Wolverson** has been appointed a Deputy Director-General of the Post Office in succession to Sir Ronald German.

Retiring from the position of chairman of the Eire Electricity Supply Board (a position he had held for 30 years) at the end of last month, **Mr R. F. Browne** was recently presented with a seventeenth-century teaset at a dinner given by the other board members. Mr Browne's successor is to be **Mr T. Murray,** who has been deputy chairman of the board since June, 1959. Before his appointment to the board, Mr Murray had been deputy secretary in the Department of Industry and Commerce since 1954. (*ESH, page 178.)

Mr A. Geoffrey Banks has been elected president of the Engineering Centre, Birmingham, in succession to **Mr Victor Brenner,** who has held the office for the past four years. Mr Banks is a director of Johnsons Iron and Steel Co.

Dr. Peter Axon, O.B.E., managing director of Ampex Electronics Ltd., has been further appointed as managing director of Redwood City Engineering Ltd., the UK marketing subsidiary of Ampex International S.A. (Fribourg, Switzerland). He is already managing director of Ampex Electronics Ltd., the UK manufacturing subsidiary.

The Eastern Electricity Board have appointed **Mr Ralph Cloke,** A.M.I.E.E., as a senior assistant engineer at their Wherstead headquarters in the place of **Mr H. T. Ransley,** recently appointed engineer, Fens sub-area. Born at Maidstone, Mr Cloke was educated at the Colchester Royal Grammar School and Medway Technical College. He joined the Kent Electric Power Co. in 1930 and, with the exception of a period during the war, he remained with that company until 1948, being appointed technical assistant in 1945. Mr Cloke joined the Eastern Electricity Board in 1948 as an assistant engineer in the development section at the board's headquarters.

Until recently regional manager in Scotland and Northern Ireland for the AEI Lamp and Lighting Co. Ltd., **Mr J. M. Anderson** has joined the Stella Lamp Co. as their sales agent in those areas. Mr Anderson was superintendent of Metropolitan-Vickers' Lamp and Lighting Department in Scotland from 1930 to 1955, after being manager, East and North of Scotland area for Metro-Vick Supplies Ltd. for five years.

Mr George Hanson, until recently manager of Hoover Ltd.'s Glasgow East district, has retired from the company after 30 years' service. His retirement was marked by a presentation ceremony in Glasgow, at which gifts were made to him from his many friends and colleagues. **Mr J. Anderson** succeeds Mr Hanson as district manager of Glasgow East (he was formerly district manager at Glasgow West). **Mr F. Donnelly** has been appointed district manager of Glasgow West (he was formerly district manager at Bolton) and **Mr R. B. Carpenter** has been appointed district manager of Bolton.

Mr W. L. Marchant, managing director of Tersons Ltd., has been appointed to the board of the Power Securities Corporation Ltd.

At the annual general meeting of the Association of British Ebonite Manufacturers, last Thursday, **Mr A. W. Hopkins** of the General Electric Co. Ltd., was re-elected chairman for 1960-61.

Mr R. E. Powell, for 20 years president of Aluminium Company of Canada, the principal subsidiary of Aluminium Ltd., has resigned as a senior vice-president of Aluminium Ltd., and has been named honorary chairman of Aluminium Company of Canada. Mr Powell remains a director of Aluminium Ltd. and Alcan. **Mr E. J. Mejia,** chief sales management officer, has been appointed a senior vice-president of Aluminium Ltd.

Mr W. I. Nielson has been appointed secretary of Lumenated Ceilings Ltd., in succession to **Mr H. R. Heaven.** Mr Nielson has been chief accountant to the company since 1955.

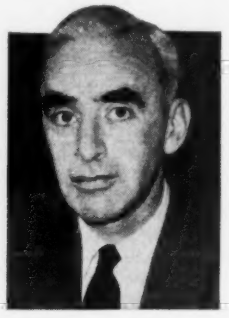
Mr P. A. Charman has been appointed sales development manager of Semiconductors Ltd., whom he joined on their formation in 1957, to build up the technical sales organisation. Earlier, he had been with Philco (Gt. Britain) Ltd. for two years, where he was responsible for the marketing of transistors. This followed 10 years' service in the electrical branches of the Royal Navy and the Royal Canadian Navy. With Semiconductors Ltd., Mr Charman will be responsible principally for dealing with technical aspects of customers' needs, especially in their long-range planning.

Mr J. A. Jackson, works director of Wolf Electric Tools Ltd., flew to Canada last week-end on a 10 days' business visit to the company's branch at Toronto.

Mr M. L. Jofeh, O.B.E., A.M.I.E.E., manager, Industrial Division, has been appointed an additional director of Sperry Gyroscope Co. Ltd. Mr Jofeh joined Sperry in 1947 as an equipment engineer, subsequently heading the engineering unit at the company's Stonehouse (Glos.) factory for a number of years. In Feb., 1954, he returned to Brentford to take up the position of deputy chief engineer and later chief engineer of the company with responsibility for the design of all new equipment. His appointment as manager of the newly formed Industrial Division was announced in Jan., 1959, when the company disclosed its reorganisation plans covering the extension of its activities into the field of industrial control systems and instrumentation.

Mr J. M. Anderson

Mr P. A. Charman



Mr M. L. Jofeh

** Denotes revision to the "Electricity Supply Handbook, 1960."*

Mr C. B. Mullins, LL.B., who has been secretary of the South Wales Electricity Consultative Council in a part-time capacity since March, 1957, is relinquishing the appointment. To succeed him the council have appointed, as full-time secretary, **Mr C. T. Martin,** A.C.I.S., who is 37 years of age and was educated at Cardiff High School. (*ESH, page 176.)

Manager of the Suffolk sub-area of the Eastern Electricity Board since 1952, **Mr P. Sydney** has been appointed manager of the board's Chilterns sub-area in succession to the late Mr R. F. Winder. (*ESH, pages 106 / 111.) Educated at Tonbridge School, Mr Sydney gained early training with Edwards and Armstrong Ltd., of Stroud, and in 1931 joined the Wessex Electricity Co. as assistant district manager. In 1936 he was appointed personal assistant to the managing director of Edmundsons Electricity Corporation, the parent concern, and after a two-year period as district manager to the Wessex company became general manager of the Cambridge Electric Supply Co. in 1941, a position he held until 1948. With nationalisation of the industry he was commercial officer of the Eastern Board's Fens sub-area until 1952.

Mr. P. Sydney

Mr W. F. Amies has been appointed to the board of the Key Engineering Co. and succeeds **Mr C. V. Oliver** as chief executive of the Reed group's converted products division.

Mr P. M. Holman has relinquished his office as joint managing director of Holman Brothers, on attaining the age of 65, but continues as chairman. **Mr J. F. Holman** is now managing director.

Mr A. L. Sutherland, a director of Philips Electrical, has been elected chairman of the British Radio Equipment Manufacturers' Association in succession to Mr F. W. Perks, British Radio Corporation. **Mr W. M. York,** the commercial director of E. K. Cole, was elected vice-chairman.

Mr O. C. Kerrison has resigned as managing director of the Paterson Engineering Co. and **Mr H. W. Coulson** has retired from the board. Mr. Kerrison will become chairman in place of Mr J. V. Sheffield, and **Mr E. Field Reid** is to be managing director. In addition D. F. G. Larkman, E. A. Oatway and R. J. O'Donovan have been appointed to the board.

Mr E. A. Ward, A.C.W.A., has been appointed secretary to Lancashire Dynamo Electronic Products, whom he joined in August, 1957, as chief accountant.

Mr G. A. Thompson, M.B.E., editor of the EDA journal, *Electrical Housekeeping*, since 1949, has resigned to concentrate on other projects.

Mr F. Eric L. Bache has resigned as chairman of Geo. Salter and Co. Ltd. The new chairman is his nephew, **Mr R. Philip S. Bache,** who has been managing director of the company since 1947 and will continue in this office additionally.

Previously with the General Electric Co. in their Wembley Research Laboratories, dealing with the design of transistorised equipments, **Mr D. D. Harding** has joined the International Rectifier Co. (Gt. Britain) Ltd., as sales engineer for the London area. The latter concern have also appointed **Mr G. W. Fisher** as sales engineer for the Midlands (he was previously with Lee, Beesley and Co., engaged on the design of control and static switching equipment); **Mr G. A. Osborn** as responsible for customer liaison in the south east of England (he was formerly with Mullard Ltd.), and **Mr M. H. Ley** as sales administration manager. Mr Ley was, until recently, sales manager for Westool Ltd., following extensive experience as a rectifier engineer with Westinghouse Brake and Signal Co., and as manager of the Rectifier Equipment Department of Standard Telephones and Cables Ltd. **Mr W. R. Baron,** who was responsible for planning the Oxted factory of International Rectifier, and until recently acted as their sales manager, has now transferred to the American Corporation in Los Angeles to undertake a position with their Engineering Department.

Mr W. Brining, F.C.A., has been elected president of the Aluminium Development Association for the period 1960-61. He represents the Almin group of companies on the ADA Council.

OBITUARY

Mr R. M. Russell, A.M.I.E.E., who died on 30 April, aged 79, was involved in many early rural electrification schemes in Scotland. When he retired six months ago he voluntarily wound up his firm of R. M. Russell Ltd., electrical contractors, Carmyle, which he established in 1909.

Mr J. B. Gatley, managing director of W. H. Gatley and Co. Ltd., electrical engineers, Todmorden, died on 30 April, aged 45.

Mr R. F. Winder, M.I.E.E., manager of the Chilterns sub-area of the Eastern Electricity Board, died on 22 April, aged 61. Mr Winder went to the Chilterns sub-area, in succession to Mr S. F. C. Whitmore, a year ago, and had previously been manager of the board's Hendon district. (*ESH, page 106.) Educated in Croydon and later at King's School, Canterbury, where he was captain of games and rugby, Mr Winder's studies were interrupted by the war and he served first in the Royal Flying Corps and later in the RAF and gained his wings as a pilot. On his release from the service he obtained his technical training at Faraday Hse and from 1923-1924 was employed by W. T. Henley's Telegraph Works Co. Ltd., in the foreign sales department. He joined the North Metropolitan Power Co. as an assistant engineer in the Chingford district, afterwards moving to Royston and then to Hoddesdon, where he remained until he went to Hertford as the sales engineer in 1931. He was promoted district engineer in 1936 and became district manager two years later. In 1952 he was appointed district manager of Hendon.

Mr L. J. Cross, A.M.I.E.E., senior lecturer in electrical engineering at Coventry Technical College, has died, aged 56. He joined the staff of the College in 1928, became senior assistant in 1946, and senior lecturer in 1951.

Mr A. Blackstock, latterly joint managing director of Langley London Ltd., died recently.

Mr J. R. MacCabe, M.SC., B.SC., senior information officer to the European Organisation for Nuclear Research (CERN), died on 17 April, aged 45.

Mr W. A. G. Barrett, formerly a director of Gowshall (T.I.) Ltd., died on 24 April.

Mr W. J. Belsey, formerly manager of the Marine Department of the British Thomson-Houston Co. Ltd., died on 23 April, aged 86.

Mr P. C. Jones, M.I.E.E., formerly sales director of Allen West and Co. Ltd., died on 28 April, aged 75. After early training with the former British Westinghouse Co., Mr Jones joined Allen West and Co. Ltd. in June, 1911. He opened the company's Manchester office, and was manager there for 17 years before going to Brighton as sales director in Sept., 1928. This position he held until his retirement on 31 Jan., 1957.

Mr A. S. Kettle, who was manager of the British Thomson-Houston Co. (now AEI (Rugby) Ltd.) Construction Department until May, 1956, died on 26 April, age 69. After his retirement he acted as consultant to the Construction Department and Service Engineer's Department. He served a three-year apprenticeship with the Bournemouth and Poole Electricity Supply Co. and was shift engineer at Christchurch generating station for a further six months before going to Rugby, in 1911, to join the BTH Testing Department. In 1915 he was appointed chief-of-test, a position he held until 1928. He then became service engineer and during the succeeding 13 years, travelled widely for "on the spot" investigations of technical problems and associated with the performance of capital plant installed at home and abroad. During the second World War, Mr Kettle was seconded for duty as manager of the Brimsdown works of the AEI Group engaged on the production of electronic components for the Services. He returned to Rugby in 1946 and, two year's later, became manager of the Construction Department responsible for plant erection and maintenance outside the BTH factories.

TOP EFFICIENCIES IN 1959

BLYTH "A" power station heads the CEGB thermal efficiency list for the calendar year 1959 with an efficiency of 33·88%. This station has 120 MW reheat sets (Metropolitan Vickers—now AEI) fed by 860 klb/hr boilers by Babcock and Wilcox, and it is the first time it has figured in the top 20 efficiency list. Last year's top-of-the-list, Castle Donington, is now third, with an efficiency somewhat lower than that achieved in 1958.

Comparative figures for the best stations of the Scottish generating authorities were 32·60% for the Kincardine (S of S EB) station, which has a 120 MW set as well and 31·17% for the same board's Portobello HP station.

Overall average thermal efficiency of all power stations operated by the CEGB during 1959 was 26·63%, compared with 25·99% in 1958. This is estimated by the CEGB to represent a saving in fuel cost of some £2·69 million. Almost one-third of the units supplied from CEGB stations came from the stations in the top 20 list, and these stations had an average efficiency of 30·67%.

Station and Division	*Thermal Efficiency %*
Blyth "A" (NE)	33·88
Agecroft "C" (NWM and NW)	32·63
Castle Donington (EM)	32·52
Ferrybridge "B" (Y)	32·18
Drakelow "B" (EM)	32·14
Willington "A" (EM)	31·96
Drakelow "A" (EM)	30·81
Marchwood (S)	30·73
Rogerstone (S. Wls)	30·44
Meaford "B" (M)	30·41
South Denes (E)	30·11
Tilbury (E)	30·10
Stourport "B" (H.P.) (M)	30·04
Stella South (NE)	29·95
Stourport "B" (L.P.) (M)	29·78
Littlebrook "B" (SE)	29·76
Wakefield "B" (Y)	29·66
Portishead "B" (SW)	29·64
Stella North (NE)	29·36
Hams Hall "C" (M)	29·26

Two-speed motor with one winding

AN induction motor giving two speeds yet having only a single stator winding has recently been constructed by the Heavy Plant Division of AEI Ltd., Rugby. The machine design uses the technique of "pole-amplitude modulation," investigated by Professor G. H. Rawcliffe at Bristol University, and described in IEE paper 2597 U "Induction motor speed changing by pole-amplitude modulation."

I.D. fan motor

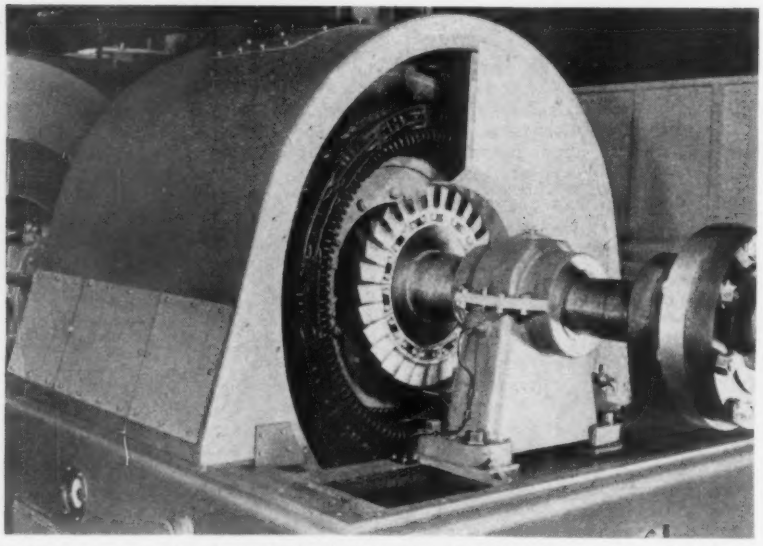
An i.d. fan motor used to try the new winding was originally designed with two independent stator windings to give outputs and speeds of 800 h.p. at 750 r.p.m. and 450 h.p. at 600 r.p.m. Replacing the two windings by a single winding using the new technique and also changing the stator core to accommodate the new winding shows that the modified machine could be housed in a smaller stator frame. The motor performance proved to be substantially the same as the equivalent double winding machine.

"Pole-amplitude modulation"

Professor Rawcliffe has proposed two methods of accomplishing pole-amplitude modulation. In the first, the second half of each phase winding is reversed as a whole with respect to the first half; while in the second, a section is first omitted from each half, and half the remaining portion is then reversed with respect to the other half. If one phase winding only is considered, for example on an eight-pole machine, the effect is to produce two fields which may be, for instance, six pole and ten pole, with some poles reversed and others suppressed, i.e.,

Eight pole: N S N S N S N S
N S N S S N S N
N S N—S N S—

Conveniently, with a three-phase winding by suitable selection of the electrical spacing of the winding it is possible to eliminate one of these fields and thus be left with, say, the six-pole speed with interconnection and the eight-pole speed without interconnection. Thus the simplicity of the single stator winding is maintained, although six connecting leads are required instead of three.



Designed as a conventional two-speed induction motor with independent windings, this 800 h.p. 750 r.p.m./450 h.p. 600 r.p.m. machine shows the space saving possible by using a single pole-amplitude modulated tapped winding

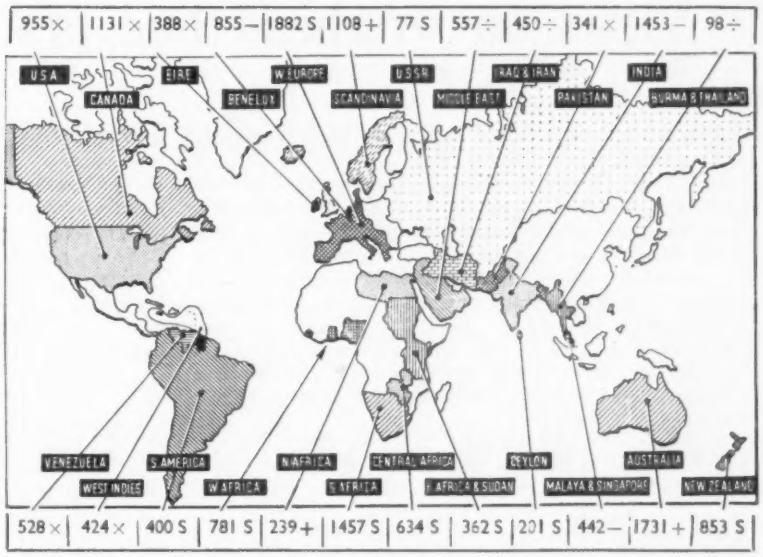
Speed ratio

The method is restricted to speeds with a ratio less than 1·5 to 1 and is, therefore, suitable for pole numbers such as 6/8, 8/10 and so on. The paper also suggests that improved performance may be obtained by using a fractional-slot winding. AEI engineers have investigated this arrangement and have found that it removes the 1·5 to 1 speed ratio limitation mentioned above, however, the method requires more leads and switching than the simple method using pole-amplitude modulation and the extensive calculations involved call for the use of a digital computer in the design stage.

As a result of these tests and new designs AEI are now offering machines with 6/8, 8/10 poles and upwards where the difference in pole numbers is two. These machines have six leads brought out and a simple switching arrangement. Additional switching permits other speed ratios to be supplied and these can be extended to two, three or four speed machines—by using two stator windings.

Distribution of Exports in £'000's Sterling

×=over 25% increase
+=10% to 25% increase
S =10%+ to 10%−
−=10% to 25% decrease
÷=over 25% decrease
on previous year's figures.



EXPORTS IMPORTS

March

DESPITE the larger number of working days, the value of exports of electrical goods during March, at £21,665,406, was slightly below the figure for February (£21,676,932) and was little better than the corresponding month of last year. Compared with a year ago, exports of electrical plant were at around the same level, but for domestic appliances there was a welcome improvement in many items. An unusual feature is the reduction in exports of radio and electronic gear compared with last year, and this drop, together with that for telephone and telegraphic equipment, has offset the increased figures in other spheres. Even the cable industry marks up a further small rise for the month.

The further sharp rise in electrical imports will also be noted—and this does not only concern domestic apparatus, although the refrigerator total was nearly eight times that of a year ago, and (see also page 739) almost doubled February's record figure. Once again Australia took the largest proportion of our electrical exports, with a total value of over £1,731,900, of which some £291,000 related to generators and motors, and £150,318 to convertors, rectifiers, transformers and switchgear. South Africa took second place with a total of £1,457,700, closely followed by India at £1,453,649. In exports of our domestic refrigerators, Sweden took the largest quantity (valued at £39,433), New Zealand following with £29,403.

Description	Exports Value (£)		Imports Value (£)	
	Mar. 1959	Mar. 1960	Mar. 1959	Mar. 1960
Generators				
Diesel up to 200 kW	529,943	417,386		
Diesel over 200 kW	327,140	111,193		
Steam turbine driven	326	87,987		
Water and gas turbines	399,101	386,349	40,715	75,161
With i.c. and other prime movers	42,962	46,385		
Generators up to 200 kW	78,463	71,269		
Generators over 200 kW	61,398	80,926		
Generator parts	446,449	790,418		
Motors, f.h.p.	183,991	329,657		
Motors 1-250 h.p.	428,563	472,332	140,680	180,818
Other motors	329,745	392,470		
Motor starters and controllers	245,357	236,542		
Convertors and rectifiers	54,009	61,252	83,724	252,783
Transformers	1,017,283	763,427		
Switchgear, to 200A, mv	301,857	342,036	92,064	171,622
Switchgear, other	1,186,127	1,044,816		
Total, Electrical Plant	*5,632,714*	*5,634,445*	*357,183*	*680,384*
Batteries, primary and parts	581,807	535,503		
Lamps filament, over 28 V	91,555	102,484		
Lamps filament, under 28 V	27,491	25,717		
Fluorescent and other lamps	113,872	87,090		
Radio and electronic gear	4,065,035	3,727,878	1,024,569	1,481,863
Telephone and telegraphic equipment	1,830,117	1,457,818		
Cookers	30,377	32,595		
Toasters	11,658	17,451		
Other cooking appliances and parts	125,186	133,149		
Space heaters	23,675	26,126	115,629	238,547
Water heaters	30,985	24,835		
Other heaters and parts	97,027	101,299		
Electric irons	65,202	73,177		
Vacuum cleaners	169,640	129,642		
Floor polishers	72,581	89,157		
Food mixers	83,460	49,410		
Washing machines, domestic	303,209	410,163		
Dryers		27,634		
Washing machine and dryer parts	66,665	89,110		
Domestic refrigerators and parts	829,093	754,735	125,538	964,611
Other appliances and parts	160,908	312,524		
Total, Domestic Appliances	*2,069,666*	*2,271,007*		
Portable power tools	203,901	222,917		
Arc welding plant	102,941	102,185	51,172	65,598
Resistance welding plant	6,152	15,704		
Electric furnaces	148,233	69,165		
Signalling apparatus	194,130	131,087		
Commercial instruments	232,015	229,544	136,501	177,149
House service meters	143,854	173,480		
Wiring accessories	188,918	215,349		
Fans	140,276	109,938		
Lighting fittings and lanterns	284,972	363,695	100,462	131,011
Other lighting equipment	77,005	85,624		
Telephone and telegraph cable	443,242	609,613		
Paper insulated cables	524,692	660,756		
Rubber insulated cables	343,506	313,759		
Thermoplastic insulated cables	170,326	264,769		
Winding and similar wires	102,925	141,413		
Other cables and wires	182,377	180,829		
Total, all cables and wires	*1,767,068*	*2,171,139*		
Accumulators and parts	257,463	269,670		
Insulating materials	190,712	240,570		
Electrical ware	82,325	134,926		
Industrial electronic control gear	92,486	138,075		
Permanent magnets	35,449	73,409		
All other articles	2,489,886	2,954,714	1,087,323	1,815,055
Total	21,120,594	21,665,406	2,998,377	5,554,218

Views on overhead line practice

THE introduction, a year or so ago, of "Preformed" overhead line hardware has focused considerable attention on differences between American and British practice in this field. Opportunity to discuss these differences was provided last week by the visit to this country of Mr Peterson, president of the Preformed Line Products Co. (Cleveland, Ohio), together with Mr Ruhlmann, vice-president for research and engineering, and Mr Hollitz, vice-president of foreign operations. Their visit was primarily occasioned by the formation of a partnership between the American firm and the British manufacturing and marketing company, Preformed Line Products (Great Britain) Ltd., Andover.

Introduction to the discussion took the form of a film of tests carried out by the Ohio Edison Electric Co. on a specimen length of 345 kV o.h. line to gain some idea of the requirements for a transmission system at this voltage they were to erect. The line had spans averaging about 1,200 ft, using twin conductors of about 1 in. dia suspended at 16 in. spacing between centres. Towers were merely portal frames with comparatively little longitudinal strength, this being provided by the earth wire.

Under high winds the film showed that when no spacers were used most conductor movement occurred in the leeward conductor; the windward conductor remained virtually stationary. Slapping of the conductors caused flattening of the wire strands and abrasion; this was cured by fitting spacers at intervals of 250 to 300 ft. Ice loading was simulated by attaching lengths of scrap conductor to the main conductors by string, which was burnt through by heater wires.

Conductor movement

The subsequent discussion quickly revealed that the main concern was with conductor movement under conditions of high winds and ice-deloading. In the latter case, British experience was cited of phase-to-phase conductor clashing with ice-deloading. There was general agreement that the ice-deloading test on the Ohio line was not really valid, but examples were quoted of another test in the US where conductor swings of between 15 and 20 ft were experienced with ice-deloading from bundle conductors.

Mr Ruhlmann suggested that the conductor design which would give complete freedom from movement would incorporate an annular air gap between the core and the outer aluminium conductors, but this would be impossible to realise in practice. Single Preformed wire spirals placed on the conductor at 10 ft intervals, however, would stop both conductor galloping and aeolian vibration. On single-conductor lines, vibration with subsequent damage or breakage could be experienced under certain conditions even if both armour rods and Stockbridge dampers were fitted, although the Preformed armour-grip method of suspension would prevent damage.

The British argument was that vibration problems were not encountered because lines were not fully tensioned and that Stockbridge dampers were fitted; but it was questioned whether such practice was not providing an uneconomically high safety factor. Mr Ruhlmann here pointed out that an American study showed that savings of the order of $6,000/m of o.h. line could be made by increasing tensions by 5%. His experience was that lines which vibrate excessively to the point of conductor damage were the exception. In many places in the US a great deal of money was "wasted" in providing Stockbridge dampers, which were regarded as a "cheap" insurance on the line. He felt that it was better to devote money to investigating the line conditions, so that dampers could be installed only where required.

Reference was also made to the current-carrying capacity of the Preformed mid-span joint, or splice. Tests have been carried out in Britain showing that overheating of the splice occurred; the test had been carried out in the laboratory with the splice under tension. Mr Ruhlmann pointed out that utility tests carried out in the US (and in some cases without tension) had also showed that the splice would overheat, but questioned whether such tests were valid with this type of splice. He argued that these static tests did not make allowance for the flexing of the splice which occurred in service and which maintained conductivity. The firm had developed a conducting grit for use with the splice which gave excellent results in laboratory tests. Unfortunately, the grit had a copper content and trials in service resulted in corrosion so that the grit was not being issued for general use. They were, however, investigating a grit with lower conductivity but which was compatible with aluminium.

NATURAL OR ARTIFICIAL?

IS daylight too expensive a commodity for modern buildings? This was the essential question in a one-day conference for architects organised last week by the British Lighting Council. Three papers around this subject were presented: on building design, by A. MacDonald, F.R.I.B.A.; on lighting techniques, by W. R. Stevens, B.SC., M.I.E.E., F.I.E.S.; and on humanitarian aspects, by H. C. Weston, O.B.E., F.I.E.S.

It was suggested that planning and use of land was uneconomic if too much insistence was placed on daylighting throughout a building, particularly as daylight is unobtainable in the large dispersed quantities required for good working conditions owing to the poor quality of atmospheric conditions. It was much better to insist on certain minimum daylight controls to encourage more economic planning, the daily variation of daylight in buildings then being stabilised by the incorporation of artificial illumination.

In the provision of artificial illumination, an adequate level (50 lm/sq ft was suggested) was not enough; it was now a question of decorating interiors with light. Perhaps it would also be necessary to imitate daylight more closely by introducing slow changes of colour and intensity; certainly it was necessary to avoid flat, static effects.

In discussion, mention was made of a factory at Slough, where partitioning cut off certain areas from a window view but without resulting in much experience of loss by users. Studies had shown that to relieve the pattern of gloom in the inner parts of a room required supplementary lighting to a level (in lm/sq ft) some 50 times the minimum daylight factor. If the window can be freed from present standards of fenestration, greater consideration could be given to making it a comfortable feature by avoiding sky glare.

Combustion efficiency

FUEL EFFICIENCY AND POWER FOR INDUSTRY EXHIBITION

THE Fuel Efficiency and Power for Industry Exhibition was opened by Sir Dennis Proctor, K.C.B., Permanent Secretary to the Ministry of Power, on 27 April at Olympia. The exhibition, which will remain open until Friday, 6 May, was supported by about 150 companies who have combined to produce an interesting but limited cross-section of that part of our industry concerned mainly with the improvement in the utilisation and control of our fuel resources. The term "Power for Industry" in the event's title is inclined to be misleading in that the exhibition stops short at steam raising and makes no reference to power plants for transforming steam into motive energy. That is to say, the fields covered are here confined to combustion, heating and steam raising.

To the electrical engineer the main interest is, therefore, in steam raising plant for, in heating applications, the transformation efficiency of electrical appliances is already 100% and, if we accept that electricity has come to be regarded as a fuel in the general sense, we may also claim it as the only non-combustible fuel in existence. In his address, Sir Dennis made reference to the improved efficiencies of steam raising plant which had been made in the recent years and the electrical industry may rightly claim its part in those efforts as recent overall thermal efficiency figures in generating stations clearly demonstrate. Latest statistics show that in the last three years the average thermal efficiency of British generating stations has risen from 24·93% to 26·1%, while average calorific values of fuels have fallen from 10,684 to 10,442 B.Th.U./lb (E.S.H. 1960).

One of the Lopulco three roller pulveriser mills for High Marnham power station. The output is 25 tons of fuel per hour and four are required for each 200 MW boiler

A Large Pulveriser

Power station engineers were particularly interested in the giant roller pulveriser on the International Combustion stand. This is a three roller Lopulco pulveriser which has been developed to meet the requirements of 200 MW capacity boilers of the type being installed at High Marnham. It will grind 25 tons of fuel per hour and four are required for each boiler. A point of interest is the ease with which the coned rollers can be replaced without a major dismantling and only a very short break in operation.

Messrs. Bastian and Allen were displaying an electrode boiler with a capacity of 800,000 B.Th.U./hr at a loading of 240 kW with automatic load control for hot water space heating systems and a 70 kW packaged steam raiser, also of the electrode type, which supplies up to 230 lb/hr for process work. The EDA stand again featured floor heating among the various exhibits which also included electric furnaces for industrial heating and factory lighting.

Electrostatic Precipitators

A number of companies exhibited equipment for the removal of fly ash from boiler flue gases. Though these included bag filters and washing systems, electrostatic precipitators were high on the list. W. C. Holmes demonstrated the Holmes-Elex process and Lodge Cottrell showed a working model of the principle of electrostatic precipitation on finely divided water particles and a static model of a precipitator similar to those which they are supplying for Blyth.

The Clean Air Act also stimulated interest in smoke detectors, and photo-electric methods of detection were demonstrated by Radiovisor Parent, Photoelectronics (M.O.M.) and others.

Thermostatic control of all forms of heating were also well in evidence, the Honeywell Controls range being particularly comprehensive and attractively engineered.

The main impression of the exhibition from the electrical industries' standpoint, however, is the wide dependance of all forms of combustion on electrical power whether it be for pumps, fans or control equipment.

The organising committee also arranged a series of meetings during the exhibition at which papers were presented for discussion. W. J. Dickie, A.M.I.MECH.E., M.INST.F., of the Federation of British Industries, spoke on the "Efficient Use of Electricity in Industry" and showed how, by a proper appreciation of the basis of available supply tariffs, the development of load factors and the correction of power factors in industrial plants, appreciable savings in power costs can be achieved and, in addition, more efficient operation of the generating and steam-raising plant can be facilitated.

equipment for industry

Cable size control

ADDING to their already comprehensive range of cable testing and monitoring equipment, Addison Electric have recently introduced an optical size control unit. The unit claims to overcome faults of earlier optical systems for monitoring cable diameter by measuring the time interval taken by a light scanner to pass across the shadow cast by the cable. This method is said to eliminate errors caused by non-uniform light intensity, cable vibration, position in the detector and the presence of extraneous materials such as dust or steam. The unit may be mounted directly after extruder plant, so giving the earliest possible indication of incorrect sheath formation. Equipment comprises the gaugehead, which also includes a micrometer control, indicator and recorder units and a control unit. These latter units may be built into a control panel. *The Addison Electrical Co. Ltd., 10/12 Bosworth Rd, London W.10.*

New metering and control units

IF a voltage transformer or similar piece of remote equipment is protected by a group of three fuses, incorrect operation of distance protection equipment may occur if one of the fuses blows, is removed or is omitted. A simple relay recently introduced has three coils connected in parallel with the fuses. Energisation of any coil by a fuse fault will operate a pair of contacts. A normally closed contact in the pair can be used, instead of three separate contacts, in series with the trip circuit, while the normally open contact is intended for giving warning of fuse failure.

Another introduction is a welding metering panel consisting of 4 in. square moving iron ammeters and voltmeters, and a 4in. diameter watt-hour meter. This panel is intended for the measurement of welding conditions and power consumption and is expected to be of particular use for research into welding techniques. The voltmeter is scaled 0/120 V. The ammeter is scaled 0/120 A, but a current transformer with four ratios can be supplied for a maximum current of 1,000 A. The wattmeter has a 100 watt hour scale. Its pointer can be reset to zero after a welding cycle. The unit also includes a relay to give overcurrent protection (if an incorrect current transformer ratio is chosen). The panel unit is housed in a case measuring 16¼ in. by 5¼ in. by 6½ in. and suitable for either switchboard or wall mounting.

Applicable to many industrial control gear problems and said to give reliability is a new range of contactless sensing devices and magnetic logic elements. The sensing devices include magnetic pushbuttons, limit switches, proximity limit switches and contactless tachogenerators. These "pick-off" units, as they are termed, can be used with the logical control elements to form comprehensive control schemes. The logic elements consist of magnetic components, mounted on printed circuits and enclosed in a nylon frame designed as a plug-in assembly. Each unit performs the functions "and," "or," "not," "memory" and "time delay." The particular function being selected by connection of the unit into the mounting panel. — *English Electric Ltd, Marconi Hse, London, W.C.2.*

Spring pin locks and fastens

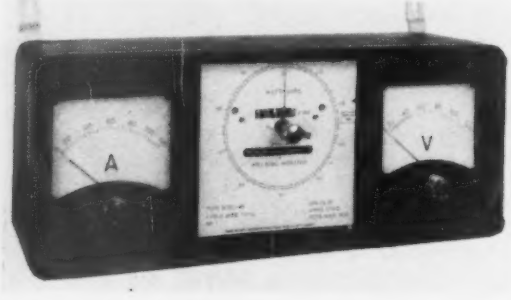
A SPLIT cylindrical spring which can be easily pressed or hammered into a hole is claimed to perform most of the fixing and fastening operations for which rivets, bolts and keys are used. The "Rollpin" is said to be unaffected by movement or vibration and yet it can be easily removed if so desired. The pins are formed from carbon and stainless steels in sizes ranging from 1/16 in. to ½ in. diameter. The "Rollpin" is driven into the prepared hole and retained in position by its own tension. Locking action is achieved in holes drilled to normal engineering tolerances. *The Tempered Spring Co. Ltd., Sheffield.*

Daylight-controlled switching

FOR lighting installations in theatre foyers, factories and other buildings where artificial lighting is switched on as daylight fades, an application will be found for a photo-electric switch recently introduced. The switch components are assembled on a printed circuit and can be adapted for operating a mercury switch relay with ratings of up to 60 A at 250 V a.c. The control unit is housed in a weatherproof case with the light sensitive cell shrouded by a strong glass dome mounted on its top. The unit can have independent light intensity settings for switching on and off. Two ranges are available, adjustable between 0·2 to 5 ft candles or 2 to 50 ft candles. *Londex Ltd., Anerley Wks, London S.E.20.*

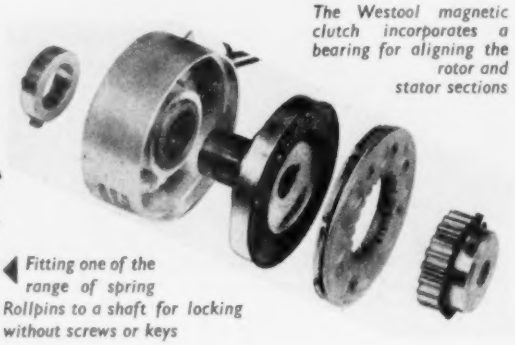
Self-centring magnetic clutches

MANY conventional types of magnetic clutch have the field and rotor system mechanically independent. It is therefore possible, due either to bad alignment or possibly to bearing wear, for the field and rotor to come into contact. The consequent rubbing may well damage the system either by rubbing action or by frictional heating which could destroy the windings. To overcome this problem a bearing mounted clutch or clutch/coupling has been introduced. In this unit the field, which carries the coil, is mounted on the rotor with its own bearing and a torque arm restrains the field from moving with the rotor. This ensures that the field is held concentric with the rotor and also that if bearing wear does occur the field automatically follows changes in rotor position, so preventing the two fouling one another. The units are available for static torque ratings of 8, 60 and 240 lb/in., for standard 28 and 90 V d.c. supplies. *Westool Ltd., St. Helen's Auckland, County Durham.*



Wall mounting meter unit for welding

Fitting one of the range of spring Rollpins to a shaft for locking without screws or keys



The Westool magnetic clutch incorporates a bearing for aligning the rotor and stator sections

for the electrical trade

Lamp price drop

CERTAIN leading manufacturers of coiled-coil lamps have announced reductions in prices. Lamps affected, 40 and 60 W, 75 W and 100 W clear and pearl lamps, are now priced 1s 5d, 2s 2d and 1s 8d, respectively, including p.t.; reductions of one penny. It is apparent from these cuts that the single-coil lamp will eventually be superseded by the more efficient coiled-coil lamp, since both types are now the same price. It is unlikely, however, that the changeover will be immediate, and at least two years may elapse before the single-coil lamp becomes obsolete for general service use.

Cheaper tube fittings

FOLLOWING the drop in prices of commercial light fittings resulting from the purchase tax concessions, AEI announce a further reduction in one series of tube light diffusers. The 5 ft single lamp model of Type F2232 has been dropped by 17%, making its price now £13 11s 9d including p.t. This fitting has an opal elliptical diffuser and black end caps, all formed from "Perspex."—*AEI Lamp and Lighting Co., Leicester.*

Economy food mixer

A DOUBLE paddle food mixer, complete with stand and accessories, can now be bought for £10 17s 8d retail. This appliance runs on a 75 W motor and has the advantage of three-speed control, governed by a switch on the thumb side of the handle. A rectangular knob in the mixer's head releases the paddles instantly when depressed, allowing rapid removal and replacement of the various mixing devices. The white toughened glass bowl stands on a metal turntable fixed to the stand, and the body fits securely into the holder. This mixer is supplied with the usual whisk, dough hooks and twin beaters as well as the stand and bowl. Its motor is of the universal type and carries a one-year guarantee.—*Bylock Electric, Enfield, Middlesex.*

The Bylcck food mixer retails at £10 17s 8d including all accessories

"Jobber" distribution

THE Revo "Jobber," a hand drill first mentioned on this page in the 5 Nov., 1959, issue, has been made more generally available. This appliance, which has a built-in spirit level and is claimed to be noiseless, is now being marketed in the West Country and South Wales as well as in the Midlands and South. Its price is listed at £8 18s 6d without accessories.—*Revo Electric Co., Tipton, Staffs.*

Rechargeable torch battery

A TORCH battery with a built-in charging circuit, the "Etromat," is soon to be distributed to retailers. The standard model is 2·5 volts, but others will be obtainable at 3·5, 5 and 6 volts with no variation in size. One battery should provide many weeks of normal intermittent use. To re-activate, a cap is removed to expose a two-pin plug connection for inserting into a socket-outlet overnight. Batteries consist of a sealed nickel-cadmium accumulator and a simple charging circuit. The first range is housed in plastic casings occupying the same space as two U2 dry cells in series. The 6 volt model has the same volume as a standard U2 3 volt assembly. The "Etromat" retails at £1 9s 6d and will be generally available in the near future.—*Electronics and Automation (London), Maxwell Hse, Arundel St, W.C.2.*

Circular suspended tube

THE present trend toward more imaginative treatment of fluorescent tubes for domestic installation is demonstrated further by the novel "Saturn" range of fittings. This range comprises Philips' warm colour circular tubes supported between the perimeters of two translucent bowls. The effect is of an enclosed and well flattened bowl, the upper and lower halves divided by a fluorescent tube. In reality the tube is invisibly fixed to a light alloy framework within the rims by clips which also secure the bowls. This framework holds the tube rigidly and provides a fixing for choke and control gear. The fitting hangs by its centre on a chain attached to the ceiling rose quite simply by a special hook device.

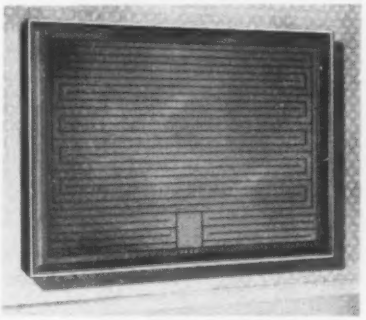
The two translucent bowls are of plastic, and can be supplied in a number of colours, dissimilar if desired. An obvious advantage of this fitting is that it provides a pleasing decorative touch without any loss of illumination, since the light is only partially diffused and not shielded by the bowls. Size of these units is approximately 16 in. diameter. The 80 W model sells at £6 19s 6d, including the tube, the 40 W £6 9s 6d. *J. Bull Electrical, Sutton Rd, Eastbourne.*

Smarter extractor

THE "Coolerway" range of extractor fans has been extended to include a model of more contemporary design, the "Coolerway Royal." It is finished in white, its outer casing modelled in smooth curving lines and rounded corners and may be mounted vertically or horizontally. Watt loading is 75. It will retail at £6 19s 6d, first deliveries commencing within the next few weeks. *Metway Electrical Industries, Canning St, Brighton 7.*

Thermopanel improvement

A NEW illumination unit has been added to the Ekco "Radiant Glass" Thermopanel, giving this heating unit a soft glow over its entire surface. A 1 kW heating element fused to the back of the toughened, rippled glass panel provides warmth which, like the lighting, is diffused over the whole area of the panel. "Radiant Glass" measures approximately 30 in. wide by 21 in. high and 3 in. deep. The wall-mounted version costs £12 19s 9d retail, the free standing unit £13 11s 2d.—*E. K. Cole Ltd, Southend-on-Sea, Essex.*



Ekco's improved "Radiant Glass" warming panel. £12 19s 9d wall-mounted

TRADE PUBLICATIONS

HONEYWELL.—16-page brochure describing electronic control of heating and air conditioning. Honeywell Controls Ltd., Ruislip Rd East, Greenford, Middx.

DOULTON.—36-page booklet illustrating the production of porcelain insulators and 12-page brochure on isolator and busbar stacks. Doulton Porcelains, Wilnecote, Staffs.

LIGHTING.—Vol. 1, No. 3 of *The Lighting Specialist*, a four-page bulletin and coloured folder on planned lighting, published by Courtney, Pope (Electrical).

New automatic washing machine for Scotland

The new Hotpoint "Supermatic" washing machine with below, a view of the "filter-clean" dish in the washing drum and the spin dryer

WITH the present trend of public favour towards the fully automatic washing/spin drying combination machines, quite a number of which have appeared on the market in recent months, it was inevitable that we should have one from the "Hotpoint" stable before long. Last week, in one of the best organised presentations for many months, the new "Hotpoint Supermatic" was introduced to the trade and press at the Turnberry Hotel in Ayrshire. The reason for the northerly venue was that it is intended to release the first production runs in this area alone and the London visitors were brought to the scene in a chartered Britannia airliner.

The new machine is in conventional rectangular styling with separate washing and spin drying compartments each with their own motor. The washing action is the well tried Hotpoint "gyrator" which has made the "Countess", "Princess" and "Empress" non-automatic models so popular. A new feature, however, is the plastic and metal "filter-clean" dish which fits to the top of the paddle shaft. Washing water is circulated through the dish to trap lint, congealed soap or detergent lumps which have a habit of becoming trapped in inaccessible corners of washing machines or are left in the folds of the washing even after spin drying. In a demonstration, the amount trapped after several washing cycles with the same articles was remarkable.

The spin dryer is a direct driven, inverted cone shape drum with bottom drainage and is rotated by the vertical-shaft motor at 2,850 r.p.m. An unusual feature is the automatic take-up in the drive which enables the motor shaft to make a few revolutions before taking the load and so facilitating starting. Control of the motor is by a microswitch operated by the last half inch of closing of the transparent plastic cover.

In the washing chamber a pump circulates the water and heating is by a 2·3 kW immersion element thermostatically controlled by a dial set in terms of the fabrics to be dealt with. Similarly, the washing period is also timed by a second control also marked in terms of the fabrics. A nylon transfer pipe, which folds neatly away, conveys water or soap solution from the spin drying chamber as it is extracted either to the adjacent sink or back to the washing bowl. The latter holds 9 gallons of water and will accommodate and wash up to 6 lb. dry weight of clothes. The machine is mounted on castors and is provided with a neat cable stowage at the rear. A short length of rubber hose is also supplied for filling the bowl or conveying rinsing water to the spin dryer. Separate flush covers are provided to each section and the finish is in white vitreous enamel.

The price, including tax, is £89 5s and the performance, so far as the demonstration could show, was up to the high level expected from all Hotpoint appliances. Asked why the first deliveries were to be to the northern area, it was explained that there were several reasons, the most significant of which was the wide usage of washing machines in the area and the experienced, critical attitude of the housewives who, it was confidently anticipated, would soon discover any weaknesses not already cleared. It was, perhaps, a little unfortunate that the new launching coincided with the Chancellor's announcements of hire-purchase restrictions. It is to be hoped that this will make little difference to the early marketing results.

BRITISH STANDARDS

Vulcanised butyl rubber compounds. *BS 3227 : 1960. Price 3s.* This is the most recent addition to a series of standards dealing with synthetic rubber vulcanisates intended primarily for use by Government departments. Suitable for the production of such components as sheets, washers, strips, gaskets, mouldings and wrapped tubing, the vulcanisates are classified into five compounds according to hardness. Requirements are specified for physical and chemical tests, whilst an appendix tabulates mixes which have been found to give vulcanisates complying with the Standard's requirements.

Specification for polythene insulation and sheath of electric cables. *BS 3234 : 1960. Price 4s.* Following earlier Standards dealing with rubber and with p.v.c., this document is the third in a series specifying requirements for cable insulation and sheathing, in this case, of course, dealing with polythene. In common with the other two Standards it relates to samples taken from the finished cable. Three main kinds of polythene compound are recognised; these are subdivided into ten types, distinguished by the presence or absence of butyl rubber and/or carbon black. Tests are specified for various qualities of the polythene, including power factor and permittivity.

British Standards Yearbook 1960. *Price 15s.* This immensely useful volume makes its welcome reappearance, listing all British Standards published up to the end of 1959, together with Codes of Practice, aircraft and school equipment standards, handbooks and special issues and IEC, ISO and CEE publications. There is also the extensive subject index, which provides a cross reference and constitutes one of the most useful features of the book. The opening section provides the usual information on the Institution, listing places throughout Britain where complete sets of standards are retained for reference.

Primary Cells and Batteries. *BS 397 : 1960. Price 15s.* The third revision of BS 397, this now incorporates BS 966 and BS 1766, which are withdrawn. Dealing primarily with Léclanché type cells and batteries for general industrial and domestic applications, it also includes references to the newer mercury cells for hearing aids. For the first time, too, the designation of all cells is changed to the agreed international system and the familiar numbering system is relegated to a bracketed reference before, presumably, disappearing altogether in subsequent revisions. Looking ahead, an appendix gives guidance in the assignment of standard sockets to new batteries not yet developed and a further appendix lists the equivalent American (ASA) cells and batteries to British (BS) and IEC designations.

Copies of British Standards noted above may be had from the BSI (Sales Branch), 2 Park St, W.1, at the prices stated. Postage is charged extra to non-subscribers.

News of the Week

E.T.U. OVERTIME BAN TO BE IGNORED?

Threat by men not on new building sites

WHILE the outcome of recent discussions between officials of the NFEA and the ETU on the question of bonus payments to contracting electricians is still awaited, certain workmen are threatening to ignore the ETU's ban on overtime.

This move has gained some ground in the Midlands, we understand, where certain ETU members, engaged on normal electrical contracting work, point out that even if a bonus for electricians on new large building sites is agreed, it is unlikely to apply to their sphere of activity.

Some of these men maintain that the loss of overtime, due to the ban imposed at the end of March, has already cost them about £50 each. Undoubtedly, the ban is disrupting contracting work on new buildings, but will other electricians continue to support the ban if any bonus award won is not applicable to themselves? Or is the answer, as has been suggested in some quarters, a general increase in pay to all contracting electricians?

The dispute originated from the Shell South Bank site strike, on investigating which a committee recommended that there should be discussions on the question of changing Clause 8 of the agreement to permit extra payments at certain sites. But the NFEA and ETU could not agree on what was meant by the committee's report, and when the union threatened other action the matter was reported to the Ministry of Labour.

The result of subsequent meetings of the two parties, under an independent chairman, is awaited with considerable interest throughout the electrical contracting industry.

Wage Claim in Engineering coming ?

AN immediate claim is to be made for a wage increase of not less than £1 a week for adult workers in engineering and shipbuilding. This was decided upon at last week's meeting of the Amalgamated Engineering Union's policy making national committee.

Apprentices' Strike Spreads

THE strike by apprentices, which began in Scotland a few weeks ago, seems likely to spread to many more firms in England and Wales before the end of this week. Efforts to spread the strike to several British electrical concerns have already been made, and a demonstration by apprentices at the AEI works at Trafford Pk took place last week-end, when an effort was made to get about 1,000 youths to join the strike. The apprentices are seeking more pay. Shipbuilding employers this week told the Confederation of Shipbuilding and Engineering Union that the wage claim could not be discussed until the boys returned to work.

Hire Purchase tightened up

THE majority of electrical appliances and equipment for domestic use are affected by the hire purchase restriction order announced last week by the Board of Trade. Under the order the minimum deposit is now 20% of the cash price with repayments over 24 months for most of the goods affected, and 10% deposit with repayments over 48 months for certain other goods. Capital goods are excluded from the hire purchase restrictions, which came into effect last Friday, 29 April.

Products requiring 20% deposit with repayments over 24 months include:

Dish washers, drying cabinets and drying machines, washing machines (excluding those designed for heating water but not otherwise operated by electricity or gas), ironing machines and irons, floor polishers, vacuum cleaners, refrigerators of not more than 12 cu ft capacity, food mixers, electric kettles and cooking utensils with heating elements (including electric hotplates), dry shavers, sewing machines, hair dryers, electric blankets and electric generating plant.

The same restrictions also apply to domestic space heating installations and radio and television receivers, television aerials, cathode-ray tubes, TV converters, loudspeakers, gramophones and radiograms, record players, tape recorders and parts thereof.

Products requiring 10% deposit with repayments over 48 months include:

Washing machines and washers designed for heating water but not otherwise designed for operation by electricity or gas, including wash boilers and coppers; domestic cookers and water heating appliances.

The order also requires advance payment of all rentals and charges for the first three months, but provision is made for certain short-term rental agreements to be exempt. Certain types of rental agreements providing for the payment of "rebates" are prohibited.

The new restrictions are the first since October, 1958, when all controls were revoked. Previously, electrical appliances had required a deposit of 33⅓% and, prior to September, 1958, 50%. The earlier credit squeeze imposing h.p. restrictions began in February, 1959.

M-R.: We endorse h.p. curb

ENDORSING the Chancellor's action in reimposing credit restrictions, Mr C. F. Richards, joint managing director of Morphy-Richards, commented:

"My personal hope is that the Chancellor, for the protection of the consumer as well as the trade, will see that it is possible never again to give complete freedom of action in the matter of hire purchase.

"Hire purchase is a facility that should be made available only to responsible people. Opening it to irresponsible elements causes violent fluctuations in trade. Our own hire purchase arrangements have always demanded reasonable deposits and a reasonable length of time over which to pay the balance."

ELECTRICAL INDUSTRY VIEW ON H.P.

COMMENTING on the hire-purchase changes, BEAMA stated: "We recognise the importance of preventing the growth of inflationary tendencies and we are glad that at least some of the essential appliances such as electric cookers, wash boilers and water heaters have been picked out for easier treatment in the new hire-purchase terms. We are very concerned, however, about the tendency to use the easy facility of credit control on appliances such as refrigerators, washing machines and vacuum cleaners as an all too frequent instrument of fiscal policy. Manufacturers of these appliances have made considerable investments in expanding their production, including expansion in the development areas, and it will not be easy for this policy to be continued if it is subject to frequent short-term measures which have an important effect on trading conditions. Manufacturers of these appliances are very active in export markets, but there must be continuity of policy to give them confidence and a stable home market in order to make the export drive really effective."

Purchase Tax Irregularities:
Dealers warned by Customs & Excise

MEASURES to prevent purchase tax malpractices by dealers on sale-or-return goods at Budget time may be taken by Customs and Excise if such laxity continues. This warning is given in a memorandum issued last week by the Commissioners of Customs and Excise.

An investigation into transactions at or about the time of the 1959 Budget, in taxable goods which had been supplied to retailers by registered manufacturers and wholesalers on sale-or-return or similar terms, has revealed considerable inaccuracies in the notifications of dates of sale or appropriation in the periodical returns submitted by dealers to their suppliers, the Commissioners state. These have resulted in the goods concerned being improperly returned as liable to the post-Budget rates of tax instead of at the higher pre-Budget rates. The registered suppliers are required to make good this tax loss.

"The Commissioners are greatly disturbed by the extent of these irregularities," the memorandum adds, "and feel bound to draw attention to the fact that returns required under sale-or-return, or similar arrangements, should be furnished to the registered suppliers promptly and accurately, and that continued laxity in this matter might cause fresh consideration to be given to the reactions of this system of trading on the purchase tax."

Precipitator Contracts for Simon-Carves

A CONTRACT for gas-cleaning plant on two 400-ton open hearth furnaces at Port Talbot, including equipment for dust conveying and disposal, has been awarded to Simon-Carves Ltd. by the Steel Company of Wales. Three three-zone electro-precipitators will recover dust in a dry state from the oxygen processed furnace gases, handling 140,000 cu ft/min with a stack emission of not more than 0·04 grain per cu ft.

Under a further contract, Simon-Carves are to supply fume removal and gas-cleaning plant for the South Durham Steel and Iron Co.'s new plate mill at West Hartlepool. An electro-precipitator, gas-storage vessel, interconnecting ducts, fan and stack, comprise the plant, which will deal with 80,000 cu ft/min of fume to give an emission of 0·02 grain per cu ft.

Computing Car Design

AN analogue computer is to be supplied by the Electronic Apparatus Division of AEI to the Ford Motor Co.'s engineering research department at Birmingham, for use in the investigation of various aspects of motor vehicle design, including the complex problems of suspension, engine mechanisms and thermal dynamics.

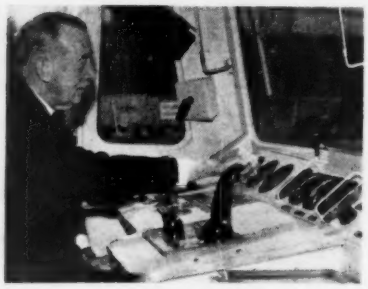
Thorpe Marsh Contract

A £600,000 contract for cooling towers for Thorpe Marsh power station has been placed with Film Cooling Towers (1925) Ltd. by the CEGB. Each tower, of the 4·8 million gallons per hour natural draught type, will be 350 ft high.

More Acquisitions

ALL the share capital of Bowler and Sidney Ltd., Slough, manufacturers of d.c. generators and welding machines, has been acquired by Frederick Braby and Co., makers of sheet, plate and sectional metal products.

Imperial Chemical Industries, for itself and on behalf of the Aluminium Co. of America (Alcoa) has acquired control of Almin Ltd., parent company of Associated Light Metal Industries. An offer made by the two companies has been accepted by over 90% of Almin shareholders.



Sir Leslie Gamage, chairman and managing director of GEC, at the controls of the new 100 m.p.h. GEC 25 kV a.c. electric locomotive. Ten of these locomotives are being supplied to British Railways and this one is now being shown at the Marylebone Exhibition of the 1960 Institute of Transport Congress

Duty on Lighters

UNDER the provisions of the Finance Bill published last week, "mechanical lighter" is redefined for Customs and Excise duty purposes as "any portable contrivance intended to provide a means of ignition, whether by spark, flame or otherwise, being a mechanical, chemical, electrical or similar contrivance." This makes electrically operated lighters subject to excise duty as from 4 Aug. next and applies to all lighters, whether complete or not, sent out by manufacturers.

N.I.C. call for simpler earth loop testing equipment

THERE is need for a relatively simple instrument for testing earth-loop impedance in electrical installations, one that can give a simple "go" or "no go" answer. This is suggested in the technical section of the progress report of the NICEIC for the quarter ending 31 March last.

Such an instrument would be mainly suitable for testing standard 13 amp socket-outlets, and the Council considers it a first essential "particularly for the smaller contractor, who is reluctant to spend a relatively large sum of money on an elaborate instrument and would be unwilling in practice readily to permit such an expensive equipment to remain for any length of period on an installation site." The Council thinks that the aim should be an instrument costing not more than £15.

A hopeful sign is seen in the increasing interest shown by the contracting industry in some form of earth-loop testing equipment. A report of available equipment of this type is being prepared for submission to the National Inspection Board.

The Board has approved a budget estimate of £56,000 for the year 1960-61, the same as in its previous year. In the quarter under review, 95 applications for enrolment were received; 57 applications were approved by the National Inspection Board, 17 rejected, and 46 deferred for further inspection; 23 firms were removed from the roll, mainly because they had ceased installation contracting, while 115 requests were received for forms of application for enrolment. Amongst activities expanding knowledge about the NIC has been the systematic programme of talks to local committees of the East Midlands Electricity Consultative Council. Meetings before a wider audience had been held at Cardiff and Middlesbrough.

OFFICIAL PUBLICATIONS

Hire-Purchase and Credit Sale Agreement (Control) Order, 1960. S.I. No. 762 (5d); Control of Hiring Order, S.I. No. 763 (4d); and Control of Hiring (Rebates) Order, S.I. No. 764 (3d). HMSO. (See page 737.)

BS 3235. Test Methods for Bitumen. 8s 6d.

Training in Radiological Health and Safety. Report of Committee to UKAEA. HMSO. 5s.

ASEE Year Book and Technical Guide, 1959-60. 5s.

Decimal Coinage and the Metric System. Should Britain Change? Report of Committees of British Association and the Association of British Chambers of Commerce. Butterworths. 7s 6d. (See page 741.)

ERA Annual Report, 1959. (See page 217.)

Reactor Course for Europe

A SPECIAL course for 48 technical executives from 17 member countries of OEEC, including the six Euratom countries, the three Scandinavian countries, Austria, Greece, Iceland, Ireland, Portugal, Spain, Switzerland and the UK, is to be held at the Harwell reactor school from 4 to 15 July. The course is designed to give senior executives who have a technical background an introduction to the principles and problems of nuclear engineering, and includes visits to research establishments at Harwell, Winfrith and Hinkley Point.

1960 Battery Symposium

THE second Battery Symposium organised by the Ministry of Aviation Inter-Departmental Committee on Batteries is to be held in the Pavilion, Bournemouth, on 18 to 20 Oct. next. Some 25 papers will be presented, covering a wide field of subjects concerned with research, development and application of battery systems. Registration fee is £3.

Full details can be obtained from Mr F. C. Wells, Ministry of Aviation, S.R.D.E., Christchurch, Hants.

Equipment on Tour

THE first touring exhibition of industrial equipment was opened by the Mayor of Croydon last week, marking the start of a 13-week itinerary embracing the principal industrial towns and areas throughout the country. Full details of the tour are available from the organiser, Mr W. G. Appleyard, 71 Broad St, Birmingham 15.

E.T.U. told "Decide, or else . . ."

LEADERS of the Electrical Trades' Union have been given until 18 May either to allow a judicial inquiry into allegations concerning ballot rigging, or to take legal action against those who made the charges. The General Council of the TUC decided on this course last week after rejecting a plea by the ETU to defer consideration of the alternatives pending the outcome of the threatened legal action by Mr L. Cannon.

The ETU have now been told that unless they inform the General Council of the TUC by 18 May of their decision on the alternatives, the union would be suspended from membership of the TUC.

But this latter decision was not unanimous, we understand, five union representatives dissenting. In any event, the act of suspension, if it is confirmed at the General Council meeting on 25 May, would have to be reported to next September's Trades Union Congress which could order re-admission, further suspension, or exclusion of the union from the TUC.

It was also revealed last week-end that the votes of 107 branches of the ETU were disqualified in the recent election of Mr F. Haxell as general secretary. A further 67 branches did not ballot at all. In that election, Mr Haxell was stated to have polled 19,611 votes and his opponent, Mr J. T. Byrne, 18,577.

Farewell to D.C.

SIXTY-NINE years of direct current power supply came to an end in Birmingham last week when the Lord Mayor (Ald. John H. Lewis) switched off a 2,000 kW a.c.-d.c. rotary converter, the last of a series of machines to go out of action as the d.c. load declined to a few units daily.

The "switch-off" followed completion by the Birmingham sub-area of the Midlands Electricity Board of a programme begun by the Birmingham Electricity Supply Dept. in 1926 to change over consumers from d.c. to a.c. The city's last direct current was used by lifts at Birmingham Council House, now converted to a.c.

Highway lighting Conference

A ONE-DAY conference on highway lighting, arranged by the British Lighting Council, will take place on 25 May at the Engineers' Club, Albert Sq, Manchester 2. Speakers will discuss the relighting experiment in Magdalen St, Norwich, and the problem of achieving uniformity and standardisation in the illumination of main roads.

Applications should be sent to the BLC's North West Regional Office, 36 St Ann St, Manchester 2.

Battery chargers for Port of London

THE increasing use of battery electric forklift and platform trucks in the Port of London has resulted in a number of orders for battery chargers for Westinghouse Brake and Signal Co. Equipment supplied includes six two-rate vehicle battery chargers with a d.c. output of 8·6 kW each at West India Dock, and six double-circuit two-rate chargers at Royal Victoria Docks.

In addition, Scruttons Ltd., a firm of stevedores, have ordered from Westinghouse a vehicle battery charger for servicing their many electric trucks. The equipment, which is fully automatic, will charge up to 20 truck batteries, the charging current being adjustable up to 600 A and the total d.c. output 29 kW.

REFRIGERATOR IMPORTS SOAR!

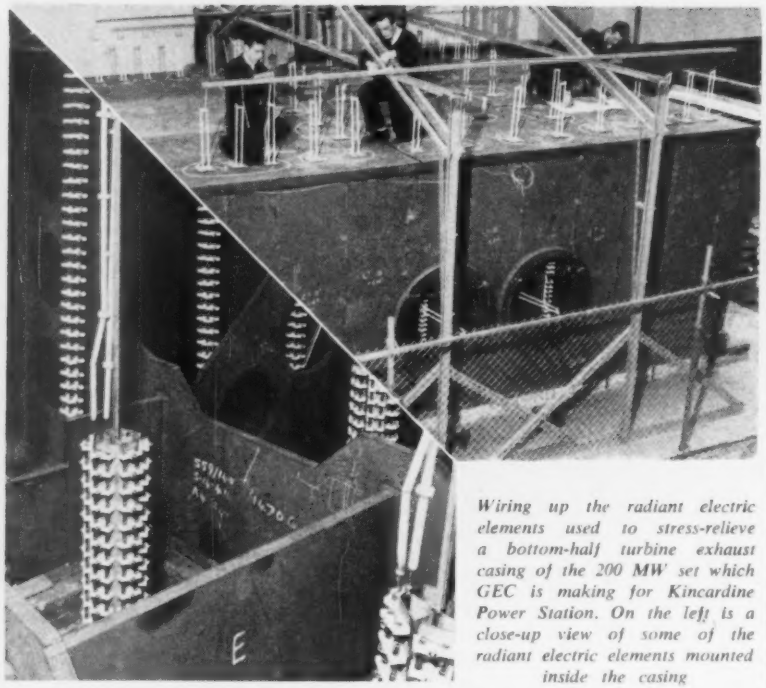
JUDGING by the latest figures of imports of domestic refrigerators, the battle between UK and foreign manufacturers is really to be joined this year. Imports of refrigerators during the month of March reached the staggering value of £964,611—more than our exports—bringing the total value of such imports in the first three months of 1960 to £1,677,593—which is more than the total sales of refrigerators by the 12 area boards in England and Wales throughout the whole of 1959!

The value of domestic refrigerators produced by British manufacturers for the home market in the last quarter of 1959 was £4·8 million, with exports totalling just over £1 million. Figures for the first quarter of 1960 are not yet available, but if the same level is maintained, it means that one in four 'fridges on sale in the UK is a foreign import.

A spokesman of the British Refrigeration Association told ELECTRICAL TIMES that British manufacturers were not viewing the situation with despondency, although one or two had expressed some anxiety. The industry generally was continuing its plans for expansion and remained confident that a thriving market would be available for a long time to come, despite the enchroachment of foreign products.

Roses for ugly lamp-posts ?

EXPERIMENTS are to be carried out by Ashbourne Urban Council in Derbyshire to see if climbing plants can be trained to climb concrete lamp-posts in order to conceal their "ugliness." A nurseryman has been called in to make tests with rambler roses, ivy and clematis. If the tests are successful the council may seek the approval of the Electricity Board to disguise all new lamp-posts in this way. The idea was suggested originally as a substitute for planting trees along the principal roads of the town.



Wiring up the radiant electric elements used to stress-relieve a bottom-half turbine exhaust casing of the 200 MW set which GEC is making for Kincardine Power Station. On the left is a close-up view of some of the radiant electric elements mounted inside the casing

Radiant electric heaters for 200 MW set stress relieving

SPECIALLY wound radiant electric heaters were used by GEC for the task of stress-relieving the bottom-half exhaust casing of a 200 MW turbine being manufactured for the South of Scotland EB. The casings have been fabricated as complete units, a departure from previous GEC practice, and one which made impracticable the previous technique of stress-relieving sections of a casing in conventional furnaces before bolting them together. Each of the Kincardine casings is 21 ft 3 in. by 17 ft by 8 ft 3 in.

Calculations of the heat input required for stress-relieving indicated a need for 68 single-phase heating elements each of 7½ kW rating. The heaters were arranged to give even heating throughout the structure, with individual control for each heater; most of the heaters were suspended, as shown.

The whole structure was covered with 6 in. thickness of thermal insulation, brought up to 650°F, then allowed to soak at this temperature for three hours. The 510 kW power supply was taken through a 750 kW transformer feeding a busbar system.

Personnel Management Conference

A THREE-DAY conference on the implications of recent research for personnel management, industrial relations and workshop behaviour is to be held at the Connaught Rooms, Gt Queen St, W.C.2, from 7 to 9 June, 1960. Organised by the Institute of Personnel Management (80 Fetter Ln, E.C.4), this is the first in a series of conferences arranged to give senior personnel officers and other industrial executives an opportunity to exchange views on current research in the field of industrial relations. The conference fee is 18 gn.

Power Station Protest

FORMAL application has been made by the CEGB to the Minister of Power for consent to build two new coal-fired generating stations in Notts, one at Holme Pierrepoint (near Bingham) and the other at West Burton.

Meanwhile, a storm of protest has greeted the Holme Pierrepoint proposal. At a meeting of Bingham Rural Council last week, letters objecting to the scheme from Holme Pierrepoint, Radcliffe-on-Trent and the council's own general purposes committee were read.

Bingham Council had previously objected to the scheme when the 525-acre site was being surveyed last June. They are now to lodge that objection with Nottingham County Council who, it is understood, would prefer to have the power station sited elsewhere in Notts, outside the Green Belt.

Savings Stamps in the South West

ELECTRICITY savings stamps are now on sale at all service centres of the South West Electricity Board as part of an "easy payment" scheme to enable the public to pay sums weekly towards quarterly accounts. The stamps, valued at 2s 6d, may also be used as deposits or instalments in hire purchase transactions.

In addition the board have introduced a scheme by which the public can settle their electricity bills by means of a banker's order to pay an agreed fixed sum every month or quarter, a balancing adjustment being made annually.

Professional Training for Electronic Engineers

CONSIDERABLE expansion of education facilities for radio and electronics engineers, particularly in full time and sandwich courses, is called for in a British Institute of Radio Engineers' report, "The Education and Training of Professional Radio and Electronics Engineers." The report argues that there must be an increased emphasis on radio and electronics in electrical engineering and physics courses generally, and there must be more new courses specifically designed for the radio and electronics profession.

The Brit. I.R.E. is recommended to continue to regard HNC with credits and suitable professional endorsements and with the appropriate radio and electronics content, as a means to professional qualification. Adequate release facilities for students to proceed to HNC is called for.

The report argues that practical experience under a qualified engineer is an essential part of the professional engineers training, but that "formally organised practical training is not the only means of achieving this." In this connection it is suggested that as far as practicable the training provided by the Services should be related to civilian courses and qualifications.

Post-graduate courses in universities and technical colleges should be encouraged, the report says, and industry should be encouraged to recognise such training. The report also endorses post-graduate research training in universities or colleges as possibly being of particular value for anyone who is to occupy an important place in industry.

Electric Chairlift

A £30,000 electric chairlift for skiers is to be built on the Cairngorms in the Highlands of Scotland. Catering for tourists, the lift will carry 500 skiers an hour in detachable two-seater chairs from a point 2,545 ft above sea level to a site 1,000 ft higher.

Work on the lift, the first sizeable one in the UK, is to start immediately, and it is hoped to complete it by October next. The project is part of an extensive plan by the Cairngorms Winter Sports Development Board Ltd.

Gardening made easy—the electrical way

A NOVEL exhibition to show how electricity can take the hard work out of gardening, arranged by the London Electricity Board and nine leading manufacturers of electrical gardening equipment in co-operation with Fisons Ltd., opened at Fisons Garden Centre, 95 Wigmore St, W.1, last Tuesday. Electrical products on show include hedge trimmers, lawn mowers, heating, cooling and ventilating equipment for greenhouses, soil sterilisers, and a wide range of other labour saving devices. The exhibition is open weekdays from 9.15 a.m. to 5.15 p.m. (7 p.m. Thursdays) until 13 May; admission free.

Electric Greenhouse wins Prizes

BRITAIN'S automatic electric greenhouse featured at the Ghent Florialia, Belgium, last week, won first prizes in each of the three classes for which the exhibit was eligible in the scientific section. One of the major awards, for methods of heating, went to E. K. Cole Ltd.

The greenhouse (described on p. 622 of our 14 April issue) was exhibited jointly by BEAMA and the British Committee for Overseas Flower Shows, and aroused considerable interest among visitors, including electricity supply and agricultural authorities.

No Urgency for Metric System

THERE is no strong feeling in industry or commerce that Britain is being adversely affected by keeping to the pound-foot system of weights and measures rather than the metric system. That is the conclusion of committees appointed by the British Association for the Advancement of Science and the British Association of Chambers of Commerce, recorded in a joint report published this week.

The report is the result of two years' work involving evidence from some 2,000 organisations. It considers the cases for and against adopting the metric system and/or a system of decimal coinage. The committee's approach has been objective; no assumptions were made that either a decimal coinage or a metric system of weights and measures is superior to the system at present in use in this country.

The general picture with regard to costs is that if a change to the metric system were decided on, there would be very heavy transitional costs in some spheres, particularly in industry; but financial benefits proved harder to assess. In the majority of cases a time interval for complete change over from the Imperial to the metric system would require 10 years, and in some cases 20-30 years would be required.

The committee concludes that it cannot recommend compulsory adoption of the metric system by the UK. However, it records a general feeling that the metric system will in course of time become more widely used in the world as a whole and in the UK. To keep a watch on the world situation, formal two-yearly reviews by the Board of Trade in consultation with industry and commerce and with corresponding bodies in the Commonwealth and the USA are recommended. Object of such reviews would be to study jointly significant world developments in the use of metric and non-metric systems, together with progress in adoption of metric and non-metric standards.

Despite this feeling about the metric system, the committee is agreed that there is real advantage to be gained now by increased rationalisation of the Imperial system of weights and measures. This can take the form of rationalisation by excluding intermediate units and using decimals more extensively.

The committees found approval for the concept of decimal coinage, although there was little corresponding dissatisfaction with the present system. They think that on the available evidence there is a strong case for adoption of a decimal system, but they warn that from evidence received mainly from industry and commerce may not accurately reflect public opinion. However, they call for an early decision by the Government in principle and suggest that if a decimal coinage were to be adopted three years notice would be required to make essential preparations.

In a more detailed analysis of evidence received on the metric system, the report notes that three-quarters of the firms from the electrical industry giving evidence approve such a change.

Dragon's "Time Capsule"

A STEEL cylinder containing plans of the reactor, a copy of the project agreement, and coins from the signatory countries was laid in the concrete foundation slab of the Dragon reactor building during the inauguration ceremony at the Winfrith site on 27 April. The "time capsule" was installed by Dr Sigvard Eklund, of Sweden, chairman of the Dragon board of management.

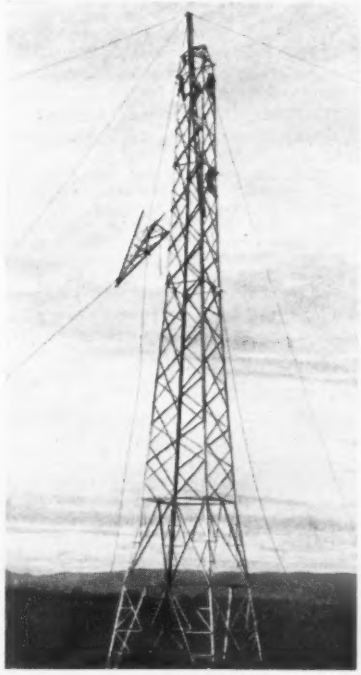
A 20 MW high temperature gas-cooled reactor is to be built on the site by an international team drawn from the UK and 11 other European countries, and will be ready in 1963.

Northern Counties 275 kV Line completed

LAST month, engineers of the Construction (Cables and Lines) Division of AEI finished a 92 mile section of the 275 kV supergrid system running from Harker, near Carlisle, in Cumberland, across Westmorland and Lancashire, to Penwortham substation two miles west of Preston. This line climbs to 1,420 ft altitude on the Shap Fells, where the route traverses much open moorland trackless country. Another difficulty encountered in erection was the crossing of the River Ribble, which is used by ocean-going ships; a clearance of 160 ft at high water was necessary here.

The 92-mile line is carried on 442 towers of Blaw Knox design, suitable for uprating to 380 kV operation. Conductors are 0·4 sq in., copper equivalent s.c.a., two per phase, with only one circuit of the eventual double-circuit line strung. At altitudes greater than 1,000 ft, the standard span of 1,200 ft was reduced to 1,000 ft to allow for severe weather conditions.

The line was constructed in two sections, each with an engineer in charge answerable to the chief site engineer, who was located at Kendal. Consulting engineers were Kennedy and Donkin.



Tower erection on the Harker-Penwortham 275 kV line—picture shows top crossarm being hoisted into place by means of a "climbing derrick" seen at the top of the tower

Experts discuss A.G.R.

FIFTY experts from the Euratom countries, led by Mr P. Caprioglio of the Euratom staff, met last week at the Risley headquarters of the UKAEA development and engineering group to discuss the UK advanced gas-cooled reactor system and the complementary work. This is one of a series of meetings for co-operation between the UKAEA and Euratom.

The new service centre of the North Eastern Electricity Board which opened in Skinnergate, Darlington, last week. Picture shows (right) the modern appearance of the all-glass frontage and (below) the spacious showroom, with its modern decor and lighting, which occupies almost the entire ground floor of the premises. A large section of the floor-space is electrically warmed, while block storage heaters are used in the board's offices on the second and third storeys

New Colour TV System Demonstrated

COLOUR television pictures transmitted from Paris to London were successfully screened on demonstration receivers at the Institution of Electrical Engineers last week when two French authors, M. R. Chaste and P. Casagne, described a new system of colour TV transmission. The pictures, relayed over a complicated radio link comprising part of the existing Eurovision link with additional micro-wave sections, were the result of engineering collaboration between the GPO and BBC, and the French Post and Telegraphs and Radio Television Française.

The new colour TV system, known as Henri de France, but now renamed Secam, provides a compatible signal which also enables standard monochrome receivers to display the colour transmissions in black and white. It is claimed to have a number of advantages over the America's currently operating NTSC system.

Basically the transmission consists of a normal black and white (luminance) signal plus colour (chrominance) information conveyed on a subcarrier. The red and blue components are transmitted sequentially for alternate picture lines only, a delay circuit repeating the signal for intervening lines. The green component is recovered in the receiver by a special circuit.

The consequent reduction in vertical colour definition, which cannot be discerned by the eye, produces considerable saving in bandwidth accompanied by an appreciable decrease of "crosstalk" and patterning effects which are sometimes troublesome in the NTSC system. Furthermore, the receiver circuitry is relatively simple and stable and quite easy to adjust.

It is claimed that the Secam system will enable comparatively low-priced colour TV sets to be produced, thus overcoming one of colour television's biggest snags, namely, the high cost of the receiver, which at present is estimated at some £300.

The two-colour receivers in the demonstration displayed pictures of good quality with satisfactory colour rendering, while a third monochrome set translated the compatible colour transmissions into acceptable black and white. The audience was one of the largest ever to attend an IEE lecture.

Stardust Ceiling

A UNIQUE ceiling designed to simulate a night sky, with 40 different constellations of stars picked out by more than 800 MES lamps, is a feature of the ballroom of the new Keirby Hotel at Burnley, Lancs, which was opened last week. Centred in the North East Lancashire development area, it claims to be one of the most luxurious in the north.

The ceiling, which is said to be the only one of its kind in the country, has a midnight blue flock finish against which the lamps, operating at 6 V from a 250 VA transformer, can be switched in sequence to provide ten different patterns of star constellations.

The electrical installation was carried out by Simpson Bros. (Hapton) Ltd.

E.A.W. Annual Conference

THE thirty-fifth annual conference of the Electrical Association for Women is being held at the Leas Cliff Hall, Folkestone, from 3 to 5 May, under the presidency of the Viscountess Kilmuir. Some 500 delegates are expected from the 196 branches in England, Scotland and Wales.

The programme included a lecture, on 3 May, by Miss Kay Pennet, describing the tour of Australia and New Zealand which she made as holder of the 1959 Caroline Haslett Travelling Exhibition. On 4 May Sir Christopher Hinton, chairman of the CEGB, delivered an address on "The Amenity Problem as it Affects the Electricity Industry."

National Safety Contest

MORE than £1,000 in prizes is being offered in a National Safety Contest, sponsored by 35 leading British companies, aimed at reducing accidents at work, in the home or on the roads. Ideas already submitted include: "daily teamwork" schemes to prevent industrial accidents, alterations in domestic cookers and utensils to prevent burns and scalds, and new types of protective clothing for industrial workers.

Entry forms are available from most industrial companies and town councils, or direct from the National Safety Contest, 36-38 Whitefriars St, E.C.4.

I.E.E. Annual Report

COPIES of the annual report and accounts for last year, to be presented at the annual general meeting of the IEE on 19 May at 5.30 p.m., can now be obtained by members of the Institution on application to the secretary.

WIGAN WASHES WHITER?

WIGAN has the highest sales record in Britain for electric washing machines, according to Consumer Research figures. In this small Lancashire town, which has an unemployment level of 2½%—higher than the national average—six out of ten homes has a washing machine.

Commenting on this record, the mayor, Councillor Sydney Burgess said: "Wigan has always been noted for its cleanliness. The women in this town don't believe in laundries. They like to do their own washing and they need a washing machine."

An appliance salesman said: "Wigan housewives are houseproud—even the poorest houses are spotless." And a dealer added: "A lot of married women in Wigan are working. They can afford a washing machine and they have no time to wash by hand."

Cables for new B.R.S. Depot

MORE than a quarter of a million yards of cables have been supplied by BICC for British Road Services' new £¾ million depot on Tyneside, opened recently by Sir Brian Robertson, chairman of the British Transport Commission. The depot provides centralisation of various facilities, including warehouses, haulage depots, service stations, vehicle parks, etc., formerly operated in Newcastle from 13 separate establishments.

Cables installed include 3,000 yd of p.i.l.c. armoured and served twin and four-core cable for mains supply; 900 yd of small sizes of mineral-insulated cable for the wiring of the petrol pumps; and some 250,000 yd of v.r.i. cable for lighting and power. The electrical installation, including the cable network, was carried out by Cairns (Newcastle) Ltd.

Questions on Cookery

BIRMINGHAM housewives were last week questioned by the Modern Cooking Promotional Committee in the first of a series of surveys to find out more about the cooking habits of British women. Aim is to discover what women really think about their cookers and what changes they would like to see. The quiz will continue in other parts of the country.

Sayings OF THE WEEK

"We have in the future to breathe a breath of life into artificial light and make it change as natural light does." . . . MR H. C. WESTON, at Conference for Architects.

"The UK electricity supply and electrical equipment manufacturing industries have long shown a jealous concern for the safety of their products." . . . The Molony Committee on consumer protection.

"Practical experience under a qualified engineer is an essential part of a professional engineer's training, but formally organised practical training is not the only means of achieving this." . . . Report on education and training by British Institution of Radio Engineers.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, May 3

	£ per ton	Weekly change £
COPPER, standard class A (settlement) ...	263	−8
,, (3 months)	249½	+½
LEAD, refined pig, 99·97% purity (cash)	77½	−¼
,, (3 months)	76¾	—
TIN, refined, min. 99·75% purity (settlement)	782	−15
(3 months)	786	—
ALUMINIUM, ingots 99-99·5% ...	186	—
,, wire bars (4 × 4 × 54")	193½	—
BRASS Strip 63/37	227	−2½
SILVER (Troy oz)	79¼d	+⅛d
ZINC, virgin, min. 98% purity (cash)	93½	+¼
,, (3 months)...	91½	+1½
RUBBER, per lb.		
No. 1, R.S.S. spot	36½d	+⅛d
c.i.f. basis, ports, July	34½d	+⅛d
ARMOURING:		
Galv. Steel Wire (0·104 in.) ...	66½	—
Mild Steel Tape (0·04 × 1½ in.)	53*	—
NICKEL (home)	600	—
MERCURY (76 lb flask)	70⅞	+½
AMERICAN PRICES:		
Copper, electrolytic (per lb) ...	33c	—
Lead (New York)	12c	—

* *Tape Price, now an average, includes varnishing*

Do-it-yourself wiring rapped by Council

UNAUTHORISED and, in many cases, dangerous electric wiring installed by amateurs in Brierley Hill council houses is to be removed when the houses are due for reletting. This recommendation was made last week to the council by the Housing Maintenance and Allocation Committee following a spot check made on 40 houses on a pre-war estate by the Midlands Electricity Board.

The board found that in nearly every house, additional wiring, in most cases defective, had been carried out by do-it-yourself enthusiasts. Plugs were not properly earthed, others had wrong polarity and, in some cases, long lengths of twin flex had been used to provide lighting circuits from room to room.

"Much of the wiring was dangerous," an MEB spokesman said. "Although we are not responsible for the safety or reliability of electrical installations on private premises, we are naturally anxious that they should be properly maintained."

The council's architect said that tenants who carried out unauthorised installations of any kind were contravening their tenancy agreements. Circulars have now been issued warning tenants that permission must be obtained from the council before work is carried out and installation must be done by a qualified electrician.

Silicone Research Award

THE research, in the 1920's, of Professor Kipping, which laid the foundations of the modern silicone industry and its associated technology, is being commemorated by the American Chemical Society in an annual "F. S. Kipping Award," which is to be endowed by Dow Corning, the American firm who played a foremost part in the commercial application of Prof Kipping's work. The award is to be made for outstanding work in organo-silicone compounds and is open to any scientist in the world engaged on non-commercial research in this field.

Sir John Glubb's views

AN interesting exposition of national changes in the Middle East in recent years was related to members of the Batti-Wallah's Society at last week's luncheon by Sir John Glubb. He emphasised that the Arab's main thoughts were for independence and progress. Yet Great Britain could still participate in developments if the right approach were made. Sir John also stressed that ideas were increasingly more important than weapons.

Advances to Nationalised Industries

DETAILS of Exchequer advances to the nationalised industries during the period 1956 to 1960 were given by the Chancellor of the Exchequer, in answer to a question in the House of Commons last week. In addition, the estimated advances for the financial year 1960-61 were quoted. The figures are, in £1 million:

	1956-7	1957-8	1958-9	1959-60	Total	1960-1
Electricity Council	148	123	139	206	616	195
N. of S. H-E Board	19·9	17·4	15·5	15·3	68·1	16
S. of S.E. Board	5·25	12	17·75	22·5	57·5	20
Gas Council	24	32	25	29	110	32

News in Brief

Negotiations are under way for a power station site in the Methil Dock area of East Fife. The docks are owned by the British Transport Commission.

Leeds Corporation Cleansing Dept. are negotiating with the Yorkshire Electricity Board for the experimental heating of a 200 yd stretch of Boggart Hill Drive.

The office of the Manchester Association of Engineers is now at 40 Brazennose St, Manchester 2. Telephone Deansgate 2140.

British Insulated Callender's Cables Ltd. are arranging to dispose of the premises and rubber manufacturing side of the business of its subsidiary, St. Helens Cable and Rubber Co., to P. B. Cow and Co.

Colwyn Bay TC are to proceed with a £31,600 scheme for sodium street lighting to supersede gas.

Company Activities

A "SUNSHINE squeeze"! Last week's Budget supplement, which requires the English banks to make special deposits of 1% and the Scottish banks ½% with the Bank of England and the re-introduction of hire-purchase controls, has now cleared the Stock Exchange air of a great deal of uncertainty. Measured by the *Financial Times* index of industrial Ordinary shares, values had, in fact, fallen by no less than 11·6% from their 1960 high and by 9% from the level to which they were temporarily raised in the short sharp burst of buying immediately preceding the Budget. But the demoralising effect of the Chancellor's calculated exercise in uncertainty extended well beyond the confines of Throgmorton Street and had permeated the banking parlours of the nation. How and whom were bank managers to discourage from exuberant borrowings and how were they to explain their negative nods to important customers? Business and industry would soon have been caught up in this same snare of uncertainty with an end result of investment "slow-down." As I have pointed out on several occasions, this is just what the Chancellor does not want. His prime worry is the adverse trend in the balance of payments and he sees a remedy in damping down the ballooning buoyancy of consumer demand with its consequent alleviation on our export effort and our import bill.

Having to hand the latest trade figures and the mid-April Clearing Bank statements, which showed advances nearly £100 million up on the month, the Chancellor took his long-delayed action which most would have preferred to have seen at the time of the Budget. Now the banks know that they have to find £75 million of liquidity to cold store with the Central Bank by 15 June. For the majority, they already had sufficient "quick" funds to do this immediately and had been preparing for 2%—or £150 million—special deposits.

Hire purchase houses conducting sound business do not seem displeased with the 20% down and two years to pay on a wide range of consumer goods. They, too, had been expecting greater severity.

All round, then, there has been a sigh of relief at these latest measures. Prospects for stock markets now look distinctly more sunny and while I do not anticipate any dramatic rise in values in the immediate future they have now sufficient reason to sustain more realistic ground above the lowest levels of April.

My selection of representative electrical shares shows how this particular section responded to the "damp-down" on Friday, the first dealing day after the announcements. Only Pye and Philips reflected the toughening conditions for TV sales while Radio Rentals,

	Closing prices 28 April before announcement of new credit measures	Close 29 April	1960 'High'
A.E.I. £1 Ord.... ...	53/3	54/9	66/6
Decca 10/- Ord. ...	48/3	48/9	56/10½
English Elect. £1 Ord.	39/6	40/6	53/-
G.E.C. £1 Ord. ...	38/-	38/9	47/6
Hoover 5/- 'A' Ord. ...	48/3	48/3	54/6
I.C.T. £1 Ord. ...	61/6	63/6	78/6
Murphy Radio 5/- Ord.	18/-	18/-	21/9
Morphy-Richards 4/- Ord	19/3	19/7½	21/6
Philips fl.10	177/9	176/9	182/6
Pye 5/- Ord.	16/6	16/4½	19/-
Radio Rentals 5/- Ord.	22/7½	25/1½	32/10½

on the prospect of even bigger business (even with three months' rental now to be paid in advance this is little more than half an average 20% deposit on TV sets), spurted 2s 6d to 25s 1½d. Hoover and Morphy-Richards reflected relief—not grief—on the possibility of reduced sales! Morphy-Richards' 4s Ordinary shares are still a couple of shillings below their 1960 high and I would not hesitate to recommend them for longer term appreciation. The same may be said for the 5s "A" Ordinary in Hoover, whose 1959 trading profit of £12·6 million compared with £7·1 million in 1958 and only £3 million 10 years ago. They still have 6s 3d to rise before they equal their 1960 peak price of 54s 6d.—*From our City Correspondent.*

Anglo-Portuguese Telephone Co.

Gross revenue for 1959 amounted to £3,424,585 (*£3,098,118*), and net profit, after all charges, is £549,930 (*£599,240*). A final dividend of 6% makes the Ordinary total again 9%.

Elliott-Automation Ltd.

Group net profit, after tax, for 1959 is £1,363,187 (*£1,125,723*), and after taxation, etc., net profit is £548,875 (*£458,628*) A final dividend of 6% maintains the total at 10%.

E. Green and Sons

For the 53 weeks to 3 Jan. last consolidated net profit, after tax, is £247,715 (compared with £79,111 for the previous 20 weeks). A final dividend of 7½% makes the total 12½%.

Harland Engineering Co.

With group profit for 1959 rising to £323,635 (*£229,522*) after depreciation, total dividend is raised to 16%, with a final of 12%, on the increased capital, against the equivalent of 9¼% last time.

Murphy Radio Ltd.

It is proposed to issue 500,000 new £1 Preference shares and to raise about £500,000 by a rights issue of Ordinary shares. The new Preference will rank *pari passu* with the existing 5½% Preference except that the dividend, to be fixed shortly, will be at a greater rate. The dividend rate on the existing Preference is to be increased to 5¼%. Mr E. J. Power, the chairman, reports that trading conditions in 1959 were much more favourable than during 1958, and the company's anticipation of an ebullient market resulted in record profits for the group. The new issues are being made in view of the increasing activity and diversification of the group. While profit margins on the radio and TV side are expected to become narrower this year, the Electronics Division has been engaged to full capacity and this condition is likely to continue, for, apart from Government work, the department is extending its activities in commercial fields.

Newman Industries Ltd.

Last year's results were a record (as we reported last week) and overall results for the current year to date show a further satisfactory increase over the same period of a year ago, both in volume of sales and profit, Mr A. J. Newman, the chairman, reports.

Power Securities Corporation

After taxation charge of £372,995 (*£278,933*), the group net profit for 1959 is £626,473 (*£520,432*) and the dividend is raised 4% to 15%.

Pressed Steel Co.

Provisional allotment letters were circulated earlier this week in a rights issue of 5s Ordinary shares offered at 30s each. These will raise a total of £10,700,000 required as part of a £24 million factory building and extension programme over the next three years. Basis of the new offer is two new shares for every 25s Ordinary capital held and 66 new shares for every £125 of debentures.

Telephone Rentals

Group net profit, after tax, for 1959 amounts to £837,503 (*£682,422*), and dividend is raised from the equivalent of 11⅞% to 15% with a final of 10%.

Worthington-Simpson Ltd.

Although profit for 1959 dropped to £886,051 from the previous year's figure of £1,058,759, the total distribution is raised 2½% to 20% with a final of 12½%. After tax, etc., net profit is £475,051 (*£543,759*).

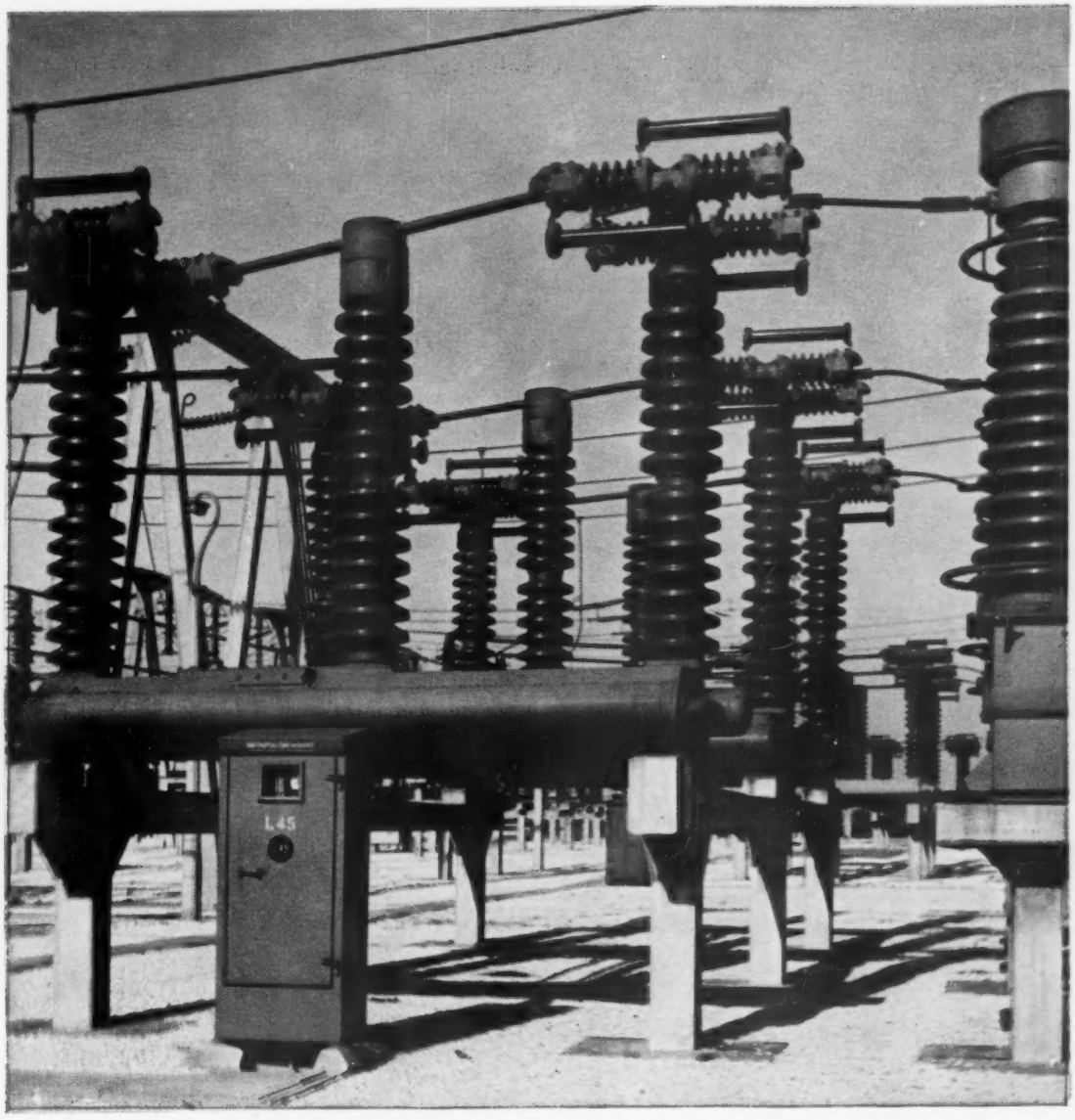
Dividends Declared

Aerialite. Interim 20% (*same*).

Contactor Switchgear. Interim 4% (*same*).

Dowding and Mills. Interim of 1½d per share (*same*).

Tube Investments. Interim of 8½% (7½%).



AEI AIR-BLAST SWITCHGEAR

TRAWSFYNYDD—Britain's latest nuclear power station, in North Wales, will incorporate a twelve-switch, double-busbar switching station, equipped with 275 kV, 7,500 MVA air-blast circuit-breakers, similar to those illustrated. They will be made at the Trafford Park Works of AEI Switchgear Division.

AEI

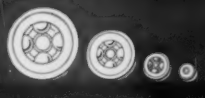
For further details, write to AEI Switchgear Division, Trafford Park, Manchester 17, or to your local AEI office.

Associated Electrical Industries Limited

SWITCHGEAR DIVISION

Trafford Park, Manchester • Higher Openshaw, Manchester • Willesden, London

From
1·5 m.m. O.D
upwards



F·B·C

miniature ball bearings

FAFNIR BEARING COMPANY LTD

Successors to Fischer Bearings Company Ltd.

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COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

5 May—Belfast T.C. (1) Modification of fire alarm bell system at Orangefield Boys' Secondary School; and (2) installation of fire alarms, bells and controller at Mountcollyer Secondary School.—See 28 April issue.

5 May—Coventry T.C. Supply of (8) lamps and accessories.—See 21 April issue.

5 May—Edinburgh. (3) Electrical installation in alterations to Hall of Residence, 12 Church Hill. Applications to Astley Ainslie, Edenhall and Associated Hospitals Board of Management, Astley Ainslie Hospital, Grange Loan, Edinburgh, by above date.

5 May—Hebburn U.D.C. (2) Electrical installations in 40 maisonnettes in Station Rd area.—See 28 April issue.

5 May—Omagh U.D.C. Rewiring in m.i.c.s. cables, supply of switchgear and lighting fittings in auditorium, stage and dressing rooms of Town Hall.—See 21 April issue.

6 May—Dagenham B.C. Lighting and power installations in 102 dwellings, Limbourne Ave.—See 14 April issue.

6 May—Glasgow T.C. Electrical installations in Bridgeton and Shettleston libraries.—See 7 April issue.

6 May—Kirkcaldy T.C. Supply of (a) electrical goods; (b) fittings; (c) lighting columns; (d) lamps; (e) cables on Lighting Dept., Schedule 2.—See 21 April issue.

6 May—Longbenton U.D.C. Supply and erection of (a) 51 sodium vapour units on concrete columns along Gt. Lime Rd; (c) 53 sodium vapour units on either concrete columns or on existing Electricity Board poles.—See 21 April issue.

7 May—Co. Fermanagh. Electrical installation in new voluntary primary school, Corrardaghy.—See 28 April issue.

7 May—Eton U.D.C. Construction of small automatic electrical sewage pumping installation together with manholes. Applications to Surveyor, R. E. Terry, Council Offices, 102 High St, by above date. Deposit £2 2s.

7 May—Londonderry. Provision of electrical engineering services at Templemore Special Care Centre, Academy Rd. Applications to Secretary, N.I. Hospitals Authority, 27 Adelaide St, Belfast, by above date.

9 May—Antrim. Electrical installations in: (1) school; and (2) servery; a new voluntary primary school for boys, Avenue Rd, Ballycastle.—See 21 April issue.

9 May—Belfast. Rewiring of Shankill Rd Y.M.C.A.—See 28 April issue.

9 May—Benfleet U.D.C. Installation of 1¼ miles Group "A" street lighting at Rayleigh Rd, Thundersley, and ¼ mile Group "B" lighting at High St, Hadleigh. Applications to Engineer and Surveyor, Council Offices, Thundersley, by above date. Deposit £1.

9 May—Lancs C.C. Electrical installation at Ulverston Hostel for Aged Persons. Applications to County Architect, P.O. Box 26, County Hall, Preston, by above date. Reference A/G.

10 May—Armagh C.C. Electrical installation in new Portadown College.—See 28 April issue.

11 May—Leighton Buzzard U.D.C. Erection of 62 Group "A" Stanton columns complete with A.E.I. lanterns and control gear on A418. Removal of 40 Group "B" columns and re-erection with new A.E.I. lanterns on various roads.—See 28 April issue.

11 May—Middleton B.C. Supply of equipment for conversion of 109 street lights from gas.—See 28 April issue.

13 May—Sheffield T.C. Supply of one 3-ton single girder crane for 38 ft span at Blackburn Meadows Wks of Sewage Disposal Dept.—See 28 April issue.

13 May—Sunderland C.B. Electrical installation in Southmoor Technical School extensions.—See 28 April issue.

14 May—Cornwall C.C. (c) Electrical services sub-contract for Perranporth County Primary School. Applications to County Architect, County Hall, Truro, by above date.

14 May—Dungarvan U.D.C. Supply and installation of two 950 g.p.m. against a 197 ft head submersible pumps, including motors, switchgear, piping, etc., for water supply improvement scheme.—See 28 April issue.

14 May—Edinburgh T.C. Readvertised tender. (2) Maintenance of telephones and bells systems for year.—See 28 April issue.

14 May—Tyldesley U.D.C. Supply and erection of 52 Class "B" and two Class "A" sodium lamps and concrete columns. Engineer and Surveyor, P.O. Box 7, Town Hall. Deposit £1 1s.

16 May—Bradford C.C. Electrical installations in 160 dwellings on Allerton housing site (Scheme 53). City Engineer and Surveyor, Town Hall, Bradford 1. Deposit £2 2s.

16 May—Omagh. Electrical installation in County Courthouse, Omagh, for M. of Finance.—See 28 April issue.

16 May—West Riding C.C. Rewiring, by contractors on N.I.C.E.I.C. Roll, at: (1) Normanton Secondary School; (2) Normanton C.E. (Aided) School; (3) S. Kirkby Common Rd Infants' School. Divisional Architect, Bishopgarth, Westfield Rd, Wakefield. Applications by above date.

17 May—Stretford B.C. Supply columns, lanterns, chokes and capacitors and separate contract lamps (various types) for street lighting. Borough Engineer, Town Hall.

18 May — Sligo Mental Hospital Board. Supply of electrical equipment: one 100 lb washing machine; one 8 cu ft hydro extractor; one 60 lb drying tumbler; one 300/32 lb ironing machine.—See 21 April issue.

20 May—Durham C.C. Supply of lamps for year to 31 Aug., 1961. Director of Education, G. H. Metalfe, Shire Hall, Durham.

20 May—East Riding C.C. Electrical services installation at proposed Filey County Secondary School. County Architect, County Hall, Beverley.

20 May—Horbury U.D.C. Contract 2. Supply and erection of two 375 g.p.m. filter effluent pumps and two 200 g.p.m. sludge pumps complete with motors, starters and accessories. Details from consulting engineers: John H. Haiste and Partners, 20 Wood La, Headingley, Leeds 6. Deposit £3 3s.

20 May—Lichfield C.C. Electrical installations, by contractors on N.I.C.E.I.C. Roll, in 90 dwellings on Wheel La estate. City Engineer and Surveyor, D. Oglesby, 62 Wade St.

20 May—Maidstone B.C. Supply and erection of two "No-choke" two-speed pumps rated at 5 to 7 and 9 to 11 m.g.d., for Allington Sewage Pumping Station. WM18 Contract M13. Applications to consulting engineers, Howard Humphreys and Sons, Victoria Station Hse, Victoria St, S.W.1, by above date. Deposit £5 5s.

21 May—Dunbarton C.C. Erection and wiring of 70 fluorescent street and footpath lighting points in Kildrum 5 area, Cumbernauld New Town. Applications to County Sanitary Inspector and Lighting Superintendent, W. Arthur, 24 George Sq, Glasgow C.2, by above date.

23 May—Cheltenham B.C. Bill 1: Supply of 69 85/140 W sodium, eight 400 W colour corrected mercury and 71 45/60 W sodium lanterns with ancillary gear. Bill 2: Supply and erection of 134 fluted steel columns together with fitting and wiring of lighting equipment.—Advertised 28 April issue.

23 May—Co. Armagh. Electrical installation in new voluntary primary school at Aghacommon, Lurgan.—See 28 April issue.

23 May—Huddersfield C.B. Electrical installation including underfloor heating in two blocks of 11-storey flats, Northgate/Southgate.—See 21 April issue.

23 May—Manchester C.C. Electrical installation in St. Mary's Rd Primary School, Newton Heath. City Architect, P.O. Box 488, Town Hall.

24 May—Coulsdon and Purley U.D.C. Provision and erection of 215 Stanton concrete columns together with 140 W sodium lamps and G.E.C. lanterns along (a) High St, Purley; (b) Godstone Rd (part), Purley and Kenley; (c) Marlpit La; (d) Smithambottom La; (e) Woodcote Grove Rd; (f) Woodcote Rd. Engineer and Surveyor, H. M. Collins, Council Offices, Purley. Deposit £4 4s.—Advertised in this issue.

25 May—Manchester C.C. Electrical installation at Rovle Green Infants' School, Northenden. City Architect, P.O. Box 488, Town Hall.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources, including an index of trade information with over 100,000 entries

A Selection from the 106 queries answered this week

"Kumanal" resistance wires—makers of? B.I.C.—Imperial Chemical Industries Ltd., Metals Division, Kynoch Wks, Witton, Birmingham 6.

"Lincass" coffee percolators—makers of? M.A.N.W.E.B.—Lincass Electric Co. Ltd., White Hart Yard, Guildford St, Chertsey, Surrey.

"Paxolin" synthetic resin-bonded boards—makers of? L.E.—The Micanite and Insulators Co. Ltd., Empire Wks, Blackhorse La, Walthamstow, E.17.

"Durex" abrasives—makers of? E.E.C. Minnesota Mining and Mnfg. Co. Ltd., 3M Hse, Wigmore St, W.1.

"Royce" washing machines—address for spares? T.E.—Home Electric Washer Co., 17 Aylmer Parade, Gt. North Rd, N.2.

"Spin-O-Matic" spin driers—makers of? L.E.B.—Elliott Domestic Appliances Ltd., Victoria Wks, Victoria Rd. Willesden, N.W.10.

Garbage disposal units—makers of? T.E.—Kenwood Mnfg. Co. Ltd., Hipley St, Old Woking, Surrey: Haigh Engineering Co. Ltd., Ross-on-Wye, Herefordshire; W. and G. Sissons Ltd., St. Mary's Rd, Sheffield 2: The Imperial Machine Co., Victoria Wks, Edgware Rd, N.W.2; Foodtech Ltd., Queen Anne's Pl, Bush Hill Park, Enfield, Middx.

30 May—Carlisle C.C. Supply, erection and wiring of 29 Group "A" and 59 Group "B" concrete columns, lanterns and ancillaries, being Stage 3—Morton St lighting. City Surveyor, 18 Fisher St.

30 May—Littleborough U.D.C. Supply, erection and putting into operation of 18 Group "A" concrete columns with 85 W sodium discharge lanterns, lamps and auxiliary gear. Engineer and Surveyor, D. W. Allison.

31 May—Ealing B.C. Contract A: Supply of 41 140 W sodium lanterns, lamps and gear. Contract B: Supply and erection of 41 25 ft steel columns. Borough Engineer, Town Hall, W.5. Deposit £5.—Advertised in this issue.

3 June—Londonderry R.D.C. Supply and installation of 150 g.p.m. at an 80 ft head centrifugal or submersible pumping plant at Kilcaltan. Details from consulting engineers: W. D. R. and R. T. Taggart, 13 College Gdns, Belfast 9. Deposit £5, payable to R.D.C.

No date stated—Burnley C.B. Supply of 140 W lamps, lanterns, transformers, condensers, 25 ft steel columns, time switches, underground and lighting cables.—Advertised 28 April issue.

No date stated—Liverpool. Applications invited for approved list for engineers' electrical supplies.—See 21 April issue.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon Hse, Theobalds Rd, W.C.1, quoting reference.*

10 May—New Zealand. 12,000 B.P.O. type switchboard lamps. Director-General (Stores Division), G.P.O., Wellington C.1. B.o.T. (ESB/10395/60).*

15 May—Jordan. Transformers, 6·6 kV and 33 kV switchgear. 400 V distribution fuse boards. Jerusalem District Electricity Co. Ltd., P.O. Box 118, Old City. B.o.T. (ESB/11254/5/6/7 and 8/60).*

16 May—India. One 3 MW steam turbo-alternator for Masuria Power House. Stores Purchase Officer, Rajastan State Electricity Board, Power Hse, Jaipur. B.o.T. (ESB/10608/60).*

18 May—Kuwait. Seven items comprising 112,300 lamps and fluorescent tubes. Dept. of Electricity, Water and Gas, Kuwait. B.o.T. (ESB/11226/60).*

18 May—Rhodesia and Nyasaland. Service meters and distribution switchboards. Town Clerk, P.O. Box 91, Umtali. B.o.T. (ESB/10009/10/60).*

20 May—India. Switchboard cables. Director-General of Supplies and Disposals, Shahjahan Rd, New Delhi. B.o.T. (ESB/10825/60).*

23 May—S.W. Africa. One 3 MW turbo-alternator, two 22 klb/hr water tube boilers, auxiliary plant, ash and coal conveyors for extension scheme. Town Clerk, P.O. Box 86, Walvis Bay. B.o.T. (ESB/8412/60).*

24 May—America. One 70,000 and one 85,000 h.p. Francis type hydraulic turbines. Dept. of the Interior, Bldg 53, Denver, Colorado. B.o.T. (ESB/10531/60).*

24 May—America. Two 93,500 h.p. vertical shaft hydraulic turbines. Dept. of the Interior, Bldg 53, Denver, Colorado. B.o.T. (ESB/10379/60).*

24 May—Rhodesia and Nyasaland. Supply of street lighting equipment; line materials and conductors; switch and fusegear; cable jointing gear. Town Clerk, P.O. Box 990, Salisbury. B.o.T. (ESB/10331/2/4 and 5/60).*

25 May—India. 152 items of a.c.s.r. conductors and accessories for 66, 110 and 230 kV lines. Chief Engineer, Madras State Electricity Board, 157 Mount Rd, Madras 2. B.o.T. (ESB/10568/60).*

25 May—Kuwait. 600 fluorescent fittings, spare chokes and capacitors. Dept. of Electricity, Water and Gas, Kuwait. B.o.T. (ESB/11234/60).*

25 May—Rhodesia and Nyasaland. 11 kV switchgear. Town Clerk, P.O. Box 91, Umtali. B.o.T. (ESB/10008/60).*

30 May—Australia. 6·6 kV, 350 MVA air-break switchgear for Vales Point. E.C. of N.S.W., Box 5257, G.P.O., Sydney. B.o.T. (ESB/10359/60).*

31 May—Rhodesia and Nyasaland. Nine items: transformers from 5 to 500 kVA. Town Clerk, P.O. Box 990, Salisbury. B.o.T. (ESB/10333/60).*

1 June—Ceylon. Transmission line materials, 42 items. Chairman, Tender Board, Ministry of Transport and Power, P.O. Box 547, Colombo. B.o.T. (ESB/10534/60).*

20 June—Australia. Cable fault location equipment. Secretary, H.E. Commission, G.P.O. Box 355D, Hobart, Tas. B.o.T. (ESB/10932/60).*

27 June—Australia. Four 120 MVA generator transformers for Vales Point. E.C. of N.S.W., Box 5259, G.P.O., Sydney. B.o.T. (ESB/10360/60).*

Gazette Announcements

COMPANIES ACTS

Universal Electrical Appliances (Mayfair) Ltd. Petition for winding-up to be heard before the High Court of Justice, Strand, W.C.2, on 9 May. Persons intending to appear to notify Titmuss Sainer and Webb, 2 Serjeants Inn, E.C.4, by 7 May.

Easiway Electrical Co. Ltd. Mr L. H. Shipton, 31 Lloyd St, Manchester 2, appointed liquidator at extraordinary general meeting on 22 April.

P.L.N. Ltd. Petition for winding-up to be heard before the Royal Courts of Justice, Strand, W.C.2, on 9 May. Persons intending to appear to notify I. Goldman and Son, 11/13 Southampton Row, W.C.1, by 7 May.

Manuus Mnfg. Co. Ltd. Mr D. Grant, 44 Knightlow Rd, Harborne, Birmingham, appointed liquidator at extraordinary general meeting on 12 April.

Refrigeration Centre Ltd., and **Icemaster (Sales) Ltd.** General meetings of members and creditors to be held at offices of Parkin S. Booth and Co., 5 Rumford Pl, Liverpool, on 23 May at 11.30 and 11.45 a.m. respectively for Refrigeration Centre and 2.30 and 2.45 p.m. for Icemaster.

BANKRUPTCY ACTS

First Meeting and Public Examination

High Court of Justice. A. C. Sewell, electrical contractor, trading as A. C. Sewell and Co. at 56 White Cross St, N.1. First meeting: 11.30 a.m., 5 May; and public examination: 11 a.m., 3 June, both at Bankruptcy Bldgs, Carey St, W.C.2.

Application for Discharge

Croydon. H. R. Jowett, electrical appliance retailer, formerly carrying on business with another as J. and L. Domestic Supplies Co. at 60 Church Rd, S.E.19. Application for discharge to be heard before the County Court, Searbrook Rd, Croydon, at 10.30 a.m. on 30 June.

Appointment of Trustee

Haverfordwest. D. H. Rees, electrical contractor, carrying on business at Brodog La, Fishguard. Mr S. Chater, 35 Windsor Pl, Cardiff, appointed trustee as from 14 April.

Release of Trustee

St. Albans. F. M. Hitchcox, electrical contractor, lately carrying on business as Burroughs Electrical Co. and as B.E. Company at 2A Lanley Rd and 18 King St and 1 Church St, Watford. Trustee: B. Phillips, 76 New Cavendish St, W.1, released as from 5 April.

Intended Dividend

Colchester. G. G. Short, manufacturing electronics engineer, lately carrying on business at John St, Market Rasen. Last day for receiving proofs for intended dividend: 10 May, to trustee: R. A. Paterson, Archdeacon Hse, Northgate St, Ipswich.

Receiving Orders

High Court of Justice. Sweeney, retailer of electrical goods, lately carrying on business at 72 Hillfield Ave, at 232 Hornsey Rd, N.7. Receiving order dated 20 April.

High Court of Justice. A. S. Evans, electrical contractor, carrying on business at "Wayside," West Rd, Bridport, Dorset. Receiving order dated 22 April.

Dividend

Bradford. K. G. W. Warren, electrical appliance dealer, now carrying on business as Falcon Sales Organisation, at 31 Little Horton La, Bradford. Dividend per £: 1s 0¾d, payable at Official Receiver's Office, 20 North Parade, Bradford 1, on 10 May.

CONTRACTS PLACED

Nuneaton B.C. Lift installation at Lydgate Court flats, Express Lift Co. Ltd., £2,228. Recommended.

Birmingham Hospital Board. Supply and erection of cables and switchgear at Wordsley Hospital, Lee Beasley and Co. (B'ham) Ltd., £14,440. Recommended.

Gosport B.C. Group "B" lighting installation, Southern E.B., £2,356. Recommended.

Ossett B.C. 1960/61 street lighting programme, Engineering and Lighting Equipment Co., £5,817.

Surrey C.C. Electrical services at Kingston Technical College, Alpha Mnfg. and Electrical Co. Ltd., £26,431.

Hebburn-on-Tyne U.D.C. Electrical installations in new houses, Edward St, N. Robinson, Electrical Contractor, Ltd., £479.

Newcastle-on-Tyne C.C. Supply of street lighting equipment: 1,200 post-top lanterns, Engineering and Lighting Equipment Co., £5,970; 1,456 columns, Stewarts and Lloyds, £11,823; 1,552 time switches, Sangamo Weston Ltd., £5,703.

TRADE NOTES

Change of Address. Precision Components (Barnet) Ltd. have moved to Kabi Works, Cranborne Rd, Potters Bar, Middx. Telephone: Potters Bar 3444.

Agency. Mr James M. Anderson, 43 Church Rd, Giffnock, Renfrewshire, is taking over from Mr Burns (who will continue to assist him) as the Scottish agent of William Geipel and Co. Ltd. for rubber and thermoplastic cable and control gear. Mr L. Scull, 94 Danethorpe Vale, Sherwood, Nottingham, has been appointed Geipel's representative for those products in South Yorks, N. Midlands and Lincolnshire.

Indian Imports. A 15% quota for imports of lightning arresters, high voltage fuses, certain transformers, metal-clad switchgear, and air and oil circuit-breakers up to 11 kV is permitted by the Government of India for the period to the end of September next. For industrial exhaust fans and blowers the percentage is raised to 20%, but for house-service meters the quota is reduced from 12½% to 10%, and for insulated copper wires and strips up to 0·0125 in. it is halved to 10%. During the periods licences will not be valid for the import of vacuum cleaners, domestic washing machines, hair dryers, electric shavers, drink mixers, water heaters, irons, room heaters, fluorescent lamp starters, kettles, desk lamps, cookers and hotplates.

The Government of India has also exempted the following imports from any duty in excess of 5%: generators, alternators, dynamos and rectifiers and parts thereof, turbines, electric motors for rolling mills, transformers above 5 MVA, 66 kV, also rectifier, flameproof and furnace transformers and commercial refrigerating machinery.

BUSINESS PROSPECTS

Aberdeen C.C. Tender: Sewage pumping plant including four 1,350 g.p.m. pumps. Surveyor. T.C. £284,600 grammar school modernisation scheme planned.

Aberdour. Hovercraft Development Ltd., 1 Tilney St, W.1, plan Donibristle RN Service site factory.

Barnet. £250,000 S. Herts College of Further Education planned.

Bathgate. British Motor Corpn. plan factory.

Beaconsfield. Burgess, Holden and Watson, 3 Burkes Parade, architects for £55,000 Ponds Home for Spastics extensions.

Belfast. Clarence Engineering Co., 24 Ormeau Ave, plan £25,000 factory.

Birmingham T.C. Tender: Four shops/dwellings. 70 one- and two-storey dwellings, three houses. Architect.

Blaydon. Wetherell, Lamb and Ptners, 24 Picton Pl, Newcastle, architects for Boyd and Co. Chain Bdge Rd factory/canteen.

Brentwood U.D.C. Tender: 72 flats, eight houses, Hutton estate. Engineer.

Brighton. Tip-Top Bakeries Ltd. plan Falmer Rd bakery. Thomsons Bakeries Ltd. plan N. Woodingdean estate bakery.

Bristol. Corporation plan £150,000 students' hostel for Bristol College of Science and Technology.

Cardiff. Rover Car Co., Solihull, Birmingham, negotiating for 120 acres land at Pengham.—S.W. Co. plan Pengham Airport factory premises. T.C. Tender: 50 Green Farm dwellings. Architect. Welsh Regional Hospital Board plan 50-acre site hospital, Heath.

Carlisle. D. W. Danson, 54 Lowther St, architect for G. W. Graham-Bowman's Burgh Rd factory.

Castle Donington. Ford and Weston, Osmaston Rd, Derby, contractors for Gordon Ellis Ltd. £27,877 joinery works.

Catterick. M. J. Gleeson, Chesterfield Rd, Sheffield, contractors for 200 dwellings.

Chester: Tender: 84 Peveril estate houses. Borough Engineer.

Chester-le-Street. S. Reed, North Lodge, plan 161 Low Flatt Rd houses.

Chichester. £21,800 extension to St. Richard's Hospital planned by S.W. Met. Regional Hospital Board.

Cork. £200,000 Carringnavar students' building planned by Sacred Heart College Fathers.

Crawley U.D.C. A. E. Henson, 117 Sloane St, architects for £276,000 council offices. £123,413 Ifield School and £47,520 Lancing Sec. School extensions planned.

Croydon. Carrington Mnfg. Co. and J. A. Brett, 21 Onslow Ave, Cheam, plan factory extensions, Vulcan Way and Lansdown Rd, respectively.—S. Croydon Investment plan 11-storey Friends Rd offices block.—Eron Investments, 32 Victoria St, S.W.1, plan High St multi-storey block.

Cullum. M. J. Gleeson, Haredon Hse, London Rd, N. Cheam, Surrey, contractors for £850,000 U.K.A.E.A. research centre.

Douglas. Harbour Bd plan £400,000 terminal buildings at Victoria Pier.

Dover. R. Corben, West Borough, Tunbridge Rd, Maidstone, contractors for £80,000 Buckland Hospital rebuilding, stage 1.

Dronfield. Wm. Gunstone and Sons Ltd., Stubley La, plan meat factory.

Dumfriesshire C.C. £360,000 comprehensive schools, Sanquhar and Kirkconnel, planned. £2,500,000 chipboard factory planned at Overton Farm for Airscrew Co. and Jicwood Ltd., Carlise Rd, Annan.

Ealing B.C. Tender: 16 Lyncroft Gdns flats. Surveyor.

Easington R.D.C. Two-way staircase switch installation planned for 2,000 houses. Surveyor.

East Retford. £54,208 Ordsall school approved.

Eastleigh B.C. Tender: Nine shops and 12 flats, Velmore housing estate. Engineer.

Edinburgh. £25,000 Elsie Inglis Hospital isolation unit planned by S. Hospitals Bd.

Exeter. W. Holford and Ptnrs, 2a Angel Court, E.C.2, architects for University's Duryard Park Estate Halls of Residence.

Fife. Tender: Police Divisional Headquarters. Clerk, Fife Police Joint Committee, Wemyssfield, Kirkcaldy.

Gillingham B.C. Tender: 44 Church St dwellings. Engineer.

Gosforth U.D.C. J. S. Allen, 26 Jesmond Rd, Newcastle, architect for new shopping centre.

Grangemouth. £5 million triple plant scheme by British Hydrocarbon Chemicals.

Gravesend B.C. Tender: 34 dwellings on four sites. Borough Engineer.

Guildford. Woodbridge Meadows factory planned by Transformers and Rectifiers Ltd. St. Luke's Hospital staff hostel planned at Warren Rd.

Hanworth. F. W. Meston, 30 Clewer Hill Rd, Windsor, architect for G.B. Cycle Components Hampden Rd factory.

Hartlepool T.C. 24 houses (three sites) planned. Borough Engineer.

Hemel Hempstead B.C. Tender: 15 Wheelers La houses and 12 two-storey flats. Engineer.

Herts, Essex, Middx. C.C.s plan old people's homes to cost nearly £70,000 each at Boreham Wood, Saffron Walden, Harefield, respectively.

Holywell U.D.C. Tender: 50 Greenfield Hall estate houses. Engineer.

Hull. O. Toffolo and Son, Temple St, plan Fountain Rd works and offices.

Huyton-with-Roby U.D.C. Tender: 43 houses, 150 flats, Mosscroft Farm estate. Architect.

Ipswich B.C. J. Owen Bond and Son, St. Faith's Hse, Norwich, architects for £100,000 Mann Egerton and Co. development.

Kilkeel. Shell Refining Co., Clement's Hse, Gresham St, plan oil refinery.

Lindsay C.C. £98,242 extensions, Breretun Secondary School, Barton-on-Humber, and £43,305 extensions to grammar school. County Architect.

Liverpool T.C. Tender: Several 11-storey flat blocks. Architect.

London. Carltons Ltd. plan three-storey Victoria Rd factory extension.—Stock, Page and Stock, 3 Fanshawe St, N.1, architects for Butlers Wharf Ltd. Shad Thames Warehouse, S.E.1.—Tender: South London Press, Leigham Ct Rd, S.W.16, printing works extensions. Architects: P. C. Boddy, 19 Palace St, S.W.1.—Austin Vernon and Ptnrs, 5 Buckingham Pl, S.W.1, architects for nine-site Buckhold Rd factory estate.—H. J. Whitfield Lewis, Queen Anne's Gate Bldgs, Dartmouth St, architect for Middlesex C.C. £40,000 Oakleigh Rd North Training School. Howell and Brooks, 4 Queen Victoria St, E.C.4, architects for £200,000 London Salvage Corps Aldersgate St headquarters (stage 1).—H. John Brewster, 16 Porchester Pl, architect for Falcon Rd, S.W.11, multi-storey office block.—Clifford Culpin and Ptnrs, 39 Doughty St, W.C.1, architects for £100,000 War Dept. Granard Rd, S.W.18, flats.—G. E. Wallis and Son, 212 Strand, contractors for £200,000 Bond St Westbury Hotel.—Kenneth Anns and Ptnrs, 1 Lincoln's Inn Fields, W.C.2, architects for Pearson, Fortsyth and Co. £700,000 Drury La premises.—F. Boreham, Son and Wallace, 4a Bloomsbury Sq, architects for Central St, W.C.1, office block.—Chapman, Taylor Ptnrs, 625 Grand Bldgs, Trafalgar Sq, architects for Westminster Trust Ltd. eight- and 31-storey Victoria St site offices.

Londonderry. A. T. Marshall, 1 Harbour Sq, architect for £150,000 Foyle College Springtown School.

Longbenton. R. Bowey and Sons, Wilham St, S. Gosforth, contractors for £40,000 Thomas Hedley and Co extensions.

Luton. Skefko Ball Bearing Co. plan Leagrave Rd office building.

Maidstone. Factory Holdings Group, 36 Wigmore St, plan Park Wood estate one-storey factory.

March U.D.C. Tender: Electrical installations included in improvement works to 93 Eastwood Ave houses.

Melton and Belvoir R.D.C. 120 houses planned.

Middlesbrough. £34,500 Stainsby Secondary Schools extensions planned. Education Architect.—P. R. Middleton and Ptnr, 111 Albert Rd, architects for Miss M. Thompson and Ptnr Acklam Rd shops.—Kitching and Co., 21 Albert Rd, architects for Greco Bros. Suffield St biscuit factory.

Middx C.C. £110,420 Edmonton County School extensions planned. £80,221 Whitefriars Secondary School phase two extensions planned. £102,652 Townfield Boys' and Girls' School phase one extensions planned.

Morpeth. 800-bed extension to Northgate and District Hospital. Newcastle Hospital Board.

Northumberland C.C. £60,000 County Technical College residential accommodation planned. £21,000 remodelling of Millfield School planned. Architect.

Peterborough. E. Anglian Regional Hospital Bd plan stage 2 of new hospital; Geo. Wimpey contractors for £279,995, stage 1. Douglas Stephen, 40 Wimpole St, architects for £800,000 shopping centre redevelopment for Oddenino's Property.

Pontypool U.D.C. Tender: 76 Trevethin site houses. Clerk of the Council.

Port Talbot B.C. Tender: 18 houses, 18 maisonnettes. Borough Engineer.—Tender: 54 Aberavon maisonnettes. Engineer.

Reigate B.C. Tender: 24 maisonnettes, Dome estate. Surveyor.

Renfrewshire C.C. £8 million school building programme planned.

Salford. Sir James Farmer, Norton and Co., Adelphi St, plan £15,000 welding shop.

Seaton Valley U.D.C. 48 Cramlington houses planned. Surveyor.

Sheffield. United Steel Co. plan £32,500,000 expansion plans including new Appleby-Frodingham rod and bar mill.

S. Shields. M. and H. Gatoff, 26 Mosley St, Newcastle, architects for Go-Gay Shoes factory. Tyne Chemical Co. factory planned at River Drive.

Sittingbourne. E. G. Harris and Ptnrs, Lynton Hse, Tavistock Sq, W.C.1, quantity surveyors for £100,000 Bowater Paper Corpn. Kemsley Mill extensions and new Gillingham premises.

Southgate. N. Bell and Webster, Essex Rd, Hoddesdon, Herts, plan Chase Rd factory extensions.

Stockton-on-Tees B.C. Hartburn Primary School assembly hall planned. Architect.

Swindon. Powell and Moya, Gt. Smith St, S.W.1, architects for £1,500,000 Princess Margaret General Hospital, second phase.

Thornaby-on-Tees. Coultas and Shaw, 33 Stephenson St, contractors for Westbury St shops/flats.—Head Wrighton and Co. plan Trafalgar St offices.

Tunbridge Wells. Burns and Guthrie, 11 Calverly Park, architects for £40,000 Memorial School for Girls extensions.

Tynemouth. T.C. plan 158 Chirton Grane East estate houses.

Urmston U.D.C. Tender: 28 Blair Ave bungalows. Surveyor's Department.

Wakefield T.C. Tender: 10 Flanshaw houses, 14 Eastmoor houses. Town Clerk.

Westmorland C.C. £145,000 Cumberland and Westmorland Farm School planned extensions.

Woodford. Peter Ednie and Ptnrs, 14 Gray's Inn Sq. W.C.1, architects for £150,000 Northern Assurance High St office block.

Wolverhampton B.C. Tender: 66 dwellings, Pond La. Engineer.

Worthing. £100,000 Worthing Hospital improvements planned.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons Ltd., 116 Chancery La, W.C.2.

Avon Electrics (Hanwell) Ltd., 133 Uxbridge Rd, W.7. Nom. cap.: £1,000. Dirs.: Gordon C. Stewart, Thomas J. Bullock and Thomas C. Bullock.

Belgravia Electrics Ltd., 16 Denbigh St, S.W.1. Nom. cap.: £100. Dirs.: Reginald W. Hollis, Stanley A. Mason, Sydney A. Pearson and Marcel L. de Pruski.

R. J. Bond Ltd., 22 Margam Terr, Port Talbot. To take over business of plumbing and electrical consultants carried on at Port Talbot by R. J. Bond, etc. Nom. cap.: £500. Dirs.: Raymond J. Bond and Mrs B. Bond.

C.J.R. Electronics Ltd., 37 Front St, Prudhoe, Northumberland. Electrical engineers, etc. Nom. cap.: £1,000. Dirs.: Geo. W. Coggins and Thomas Jones.

P. J. N. Collaro Ltd. Electronic and automation engineers, etc. Nom. cap.: £100. Dirs.: Peter J. N. Collaro and Alison J. Collaro. Subs.: Jean Herbert and Thos. A. Herbert, 156 Strand, W.C.2.

Douglas Wood Ltd., 8 Victoria St, Burnham-on-Sea, Som. Manufacturers of and dealers in radio, electrical and mechanical apparatus, etc. Nom. cap.: £1,000. Dirs.: Douglas Wood and Betty Coles.

Hartley Services Ltd., 7 Gt. Clowes St, Salford 7. To take over business of a manufacturer of fluorescent fittings and electrical goods carried on at Salford by Leo Raymond, etc. Nom. cap.: £1,000. Dirs.: Leo Raymond, Mrs Rebecca Raymond and Walter Westby.

Hermetic Components Ltd., 17 Lewisham High St, S.E.13. Mechanical, electrical, precision and general engineers, glass workers, etc. Nom. cap.: £100. Dirs.: Cecil J. A. Barton and Wm. Collie.

Home Electric Services (Midlands) Ltd. Nom. cap.: £2,000. Dirs.: not named. Subs.: Eric Hinchliffe and Mrs Jean Hinchliffe, 170 Woodside Rd, Beaumont Park, Huddersfield.

Home Electric Services (Northern) Ltd. Details similar to Home Electric Services (Midlands) Ltd.

K. and C. Electric Ltd., 53/4 Avenue Chmbrs, Vernon Pl, W.C.1. Electrical and electronic engineers, etc. Nom. cap.: £1,000. Dirs.: Herbert J. Cann, Leslie W. King and John P. Y. Thrussell.

Landmar Electrical Eng. Ltd., The New Foundry, Bridgend, Glam. Nom. cap.: £1,000. Dirs.: Geo. B. M. Hayes, Geo. F. R. Hayes, Michael R. L. Hayes and Francis E. S. Hayes.

Monberg and Thorsen (London) Ltd., 115 Leadenhall St, E.C.3. Mechanical, civil, electrical and consulting engineers and contractors, etc. Nom. cap.: £100. Dirs.: Axel S. S. Monberg and Ejnar Thorsen.

Norrland Laboratories Ltd. Manufacturers of and dealers in dynamos, motors, etc. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: Wm. J. R. Mason, 3/4 Clements Inn, W.C.2; and Robert Stevens, 96b Lower Addiscombe Rd, East Croydon, Surrey.

Pages Electric Ltd., 9 Aldridge St, Darlaston, Staffs. To carry on business of electrical equipment manufacturers and dealers, etc. Nom. cap.: £100. Dirs.: Richard W. Page and Eric G. Page.

Quadman Supplies Ltd. Distributors, importers and exporters of domestic, commercial and industrial electrical and mechanical appliances, etc. Nom. cap.: £100. Dirs.: not named. Subs.: Dorothy Graeme and Gordon V. Graeme, 61 Fairview Ave, Gillingham, Kent.

Reg. Stanton Ltd. Electrical engineers, etc. Nom. cap.: £5,000. Dirs.: Reginald W. Stanton and Mrs Frances M. Stanton, Kingsley, Twyford, Evesham, Worcs.

Robert C. Stone and Sons Ltd., 2 Lamble St, Kentish Town, N.W.5. Electrical engineers and contractors, etc. Nom. cap.: £500. Dirs.: Robt. C. Stone, Kathleen M. Stone, Albert J. Stone and Kenneth T. Stone.

Peter Woodrow (Electrical Contractors) Ltd., Bull St, Holt, Norfolk. Nom. cap.: £1,000. Dirs.: Wing Comdr Brian R. W. Hallows and Peter H. Woodrow.

Yates and Marsden Ltd., 313 Upper Town St, Bramley, Leeds 13. Nom. cap.: £200. To carry on business of electrical equipment specialists, etc. Dirs.: Eric Yates and Wm. Marsden.

MEETINGS TO NOTE

THURSDAY, 5 MAY

I.E.E. (Utilisation Section). "Safety in the Utilisation of Electricity," S. J. Emerson. Savoy Pl. 5.30 p.m.

I.E.E. (S.W. Sub-Centre). "The Application of Transistors to Line Communication Equipment," H. T. Prior, D. J. R. Chapman and A. A. M. Whitehead. Electric Hall, Torquay. 3 p.m.

I.E.S. (Nottingham Centre). A.G.M. Electricity Centre, Carrington St. 6 p.m.

FRIDAY, 6 MAY

I.E.E. (Medical Electronics Discussion Group). "Methods of Recording Measurements—Digital or Analogue." Savoy Pl. 5.30 p.m.

JUNIOR INSTITUTION OF ENGINEERS. "Standardisation of Some Electrical Measuring Instruments," F. W. L. Bosch. Pepys Hse, 14 Rochester Row, S.W.1. 7 p.m.

A.S.E.E. (Stoke and Crewe Branch). "Fire Alarms." Grand Hotel, Hanley. 7.30 p.m.

MONDAY, 9 MAY

I.E.E. (N.W. Graduate and Student Section). A.G.M. and "Noise—with Particular Reference to Transformers," P. J. Bennett. Engineers' Club, Albert Sq, Manchester. 7 p.m.

ROYAL SOCIETY OF ARTS. Cantor lecture: "The Generation of Power," Professor J. M. Kay. John Adam St, W.C.2. 6 p.m.

I.E.S. (Leeds Centre). A.G.M. Guildhall Hotel, The Headrow, Leeds. 6.15 p.m.

INTERNATIONAL HARDWARE FAIR at Olympia until 13 May.

A.S.E.E. (Bournemouth Branch). A.G.M. Grand Hotel, Firvale Rd. 8 p.m.

A.S.E.E. (N.W. London Branch). "Miniature Circuit-breakers," R. Leach. Century Hotel, Wembley. 8.15 p.m.

TUESDAY, 10 MAY

INSTITUTION OF PLANT ENGINEERS (Manchester Branch). "The Application of New Materials to Plant Engineering," J. Leyland. Engineers' Club, Albert Sq. 7.15 p.m.

A.S.E.E. (Chester Branch). "Fluorescent Lighting." Westminster Hotel, City Rd. 7.45 p.m.

A.S.E.E. (Glasgow Branch). A.G.M. Kenilworth Hotel, Queen's St. 8 p.m.

A.S.E.E. (Portsmouth Branch). "Production of a Technical Journal." Offices of the Ministry of Labour and National Service, Lake Rd. 7.30 p.m.

WEDNESDAY, 11 MAY

I.E.E. (Supply Section). "The Development of the 400 kV Network in Sweden," G. Jancke. Savoy Pl. 5.30 p.m.

I.E.E. (Bristol Graduate and Student Section). A.G.M. Large Lecture Theatre, Bristol University Eng. Laboratories. 7 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Data Processing Section). A.G.M. and "A Recording Stereocomparator," A. E. Adams. Manson Hse, 26 Portland Pl, W.1. 7 p.m.

NEWPORT AND DISTRICT ELECTRIC CLUB. A.G.M. King's Head Hotel, Newport. 6.30 p.m.

ELECTRICAL ASSOCIATION FOR WOMEN. Report on the Annual Conference at Folkestone. Discussion on "Electrical Viewpoint," 25 Fouberts Pl, W.1. 2.15 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (Radar Group). "Radio Guidance in the Automatic Landing of Aircraft," J. Shayler. London School of Hygiene and Tropical Medicine, Keppel St, W.C.1. 6.30 p.m.

A.S.E.E. (Birmingham Branch). "Industrial Lighting." R. J. F. Howard. Exchange and Engineering Centre, Stephenson Pl, Birmingham 2. 7.30 p.m.

A.S.E.E. (S.E. London Branch). "Electrical Safety," G. T. Fisher. Eltham Green School, Queenscroft Rd, S.E.9. 7.45 p.m.

THURSDAY, 12 MAY

I.E.E. "The Resistance of Sheet Insulation to Surface Discharges," J. H. Mason. Savoy Pl. 5.30 p.m.

INSTITUTION OF PLANT ENGINEERS (Glasgow Branch). "Industrial Television and its Applications," S. G. Gobbi. Scottish Bldg Centre, Sauchiehall St. 7.15 p.m.

INSTITUTION OF PLANT ENGINEERS (N.E. Branch). "Science and Industry," E. Martindale. Roadway Hse, Oxford St, Newcastle. 7 p.m.

A.S.E.E. (Bradford Branch). "Variable speed a.c. Motors," A. Bone. Midland Hotel. 7.30 p.m.

FRIDAY, 13 MAY

I.E.E. (Utilisation Section). Visit to Oxford until 15 May.

SATURDAY, 14 MAY

I.E.E. (London Graduate and Student Section). Spring dance. North Suite, Victoria Halls, Bloomsbury Sq, W.C.1. 7 p.m.

MONDAY, 16 MAY

I.E.E. (N. Staffs Sub-Centre). A.G.M. and "The Characteristics and Protection of Semiconductor Rectifiers," D. B. Corbyn. Technical College, Stafford. 7 p.m.

ROYAL SOCIETY OF ARTS. Cantor lecture: "The Transmission of Power," F. H. S. Brown. John Adam St, W.C.2. 6 p.m.

IPSWICH AND DISTRICT ELECTRICAL ASSOCIATION. A.G.M. Electric Hse, Ipswich. 7.15 p.m.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Adast in design. 797,477. Class 9. Apparatus. Adamovske Strojirny, Narodni Podnik, Adamov, near Brno, Czechoslovakia.

A.E.I. in oval. 785,588. Class 10. All goods. Associated Electrical Industries Ltd., 33 Grosvenor Pl, S.W.1.

Brillight. B792,667. Class 11. Light fittings, etc. E. Brill Ltd., 125a Northcote Rd, S.W.11.

Drial Major in design. B790,609. Class 11. All goods. B.-J. and W. Automation Ltd., 29/31 Euston Rd, N.W.1.

ETL in design. 773,246. Class 9. Telecommunication apparatus, etc. Ericsson Telephones Ltd., 22 Lincoln's Inn Fields, W.C.2.

Fethaspinna. B796,310. Class 7. Centrifugal clothes-drying machines. Fraser and Glass Ltd., Woodside La, North Finchley, N.12.

Litter-vac. 795,200. Class 9. Sweeping machines and dust collecting machines, etc. R. G. Dixon and Co. Ltd., Capitol Wks, Empire Way, Wembley.

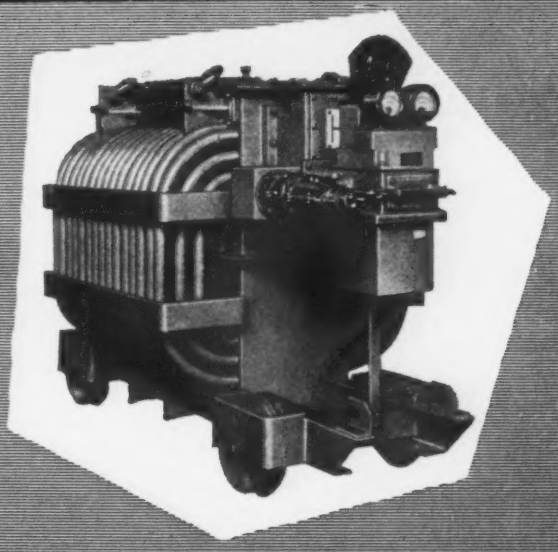
Pamrex. 800,581. Class 9. Radio apparatus, etc. Pam (Radio and Television) Ltd., 295 Regent St, W.1.

Petreco. 790,849. Class 11. Purifying apparatus for the electrical treatment of fluids, etc. Petrolite Corpn., 369 Marshall Ave, City of Webster-Groves, Missouri, U.S.A.

Platanium. 800,091. Class 9. Electrolytic and electrostatic electrodes. Sturtevant Eng. Co. Ltd., Southern Hse, Cannon St, E.C.4.

Pulsonic. 789,980/1. Classes 7 and 9. Welding machines, apparatus, etc. British Refrasil Co. Ltd., Stillington, Stockton-on-Tees.

Voltalit. 800,296. Class 17. Resinous materials for insulating purposes in jointing and terminating cables. Pirelli-General Cable Works Ltd., 343/5 Euston Rd, N.W.1.



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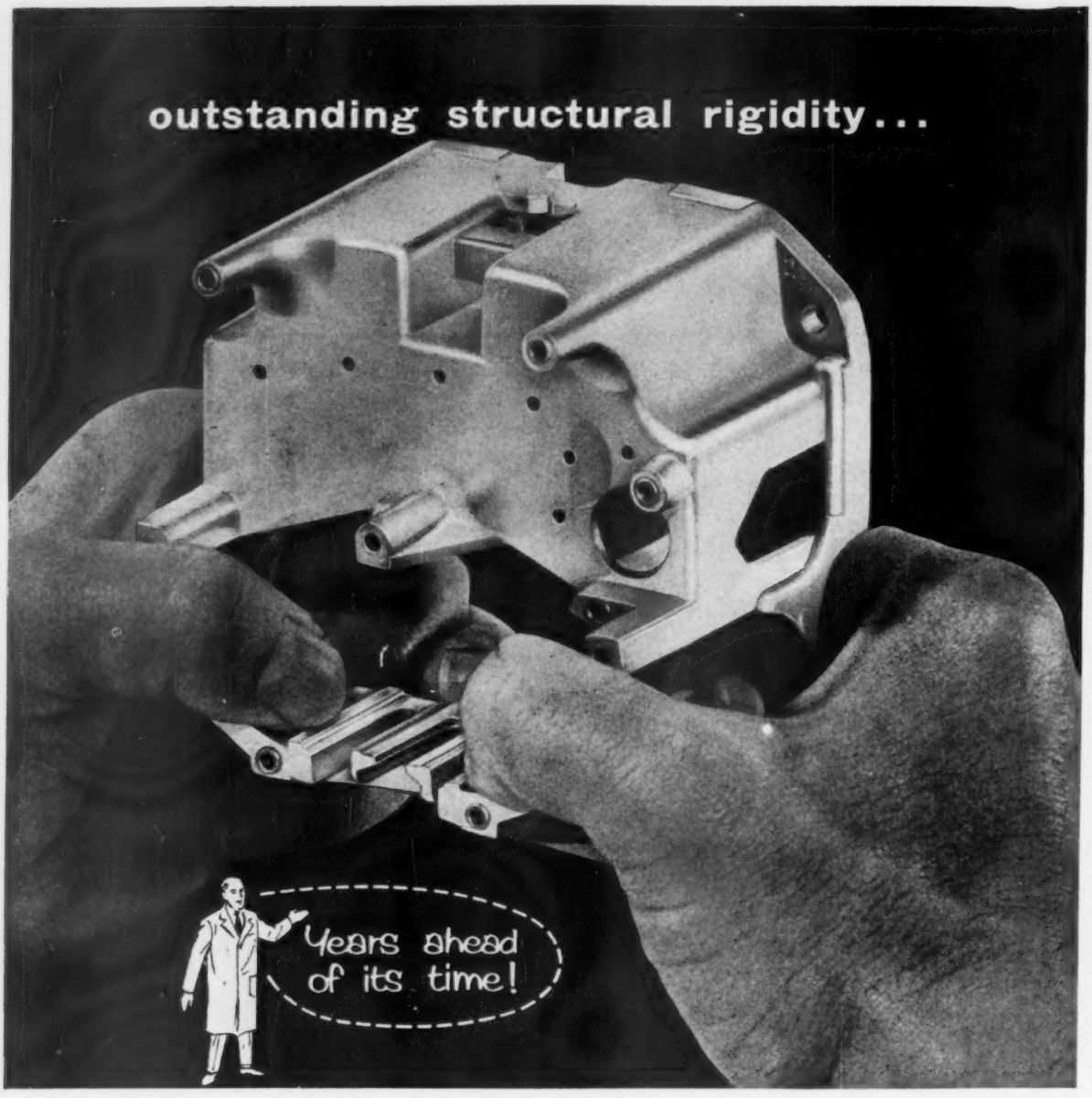
OVERSEAS REPRESENTATIVES: ARGENTINA: H. R. Roberts & Cia., S.R.L. Buenos Aires. **AUSTRALIA:** Hackbridge and Hewittic Electric Co. Ltd., 171 Fitzroy Street, St. Kilda, Victoria; N.S.W.: Queensland: W. Australia: Elder, Smith & Co. Ltd.; South Australia: Parsons & Robertson Ltd.; Tasmania: H. M. Bamford & Sons (Pty.) Ltd., Hobart. **BELGIUM & LUXEMBOURG:** Pierre Pollie, Brussels, 3. **BRAZIL:** Oscar G. Mors, Sao Paulo. **BURMA:** Neonlite Manufacturing & Trading Co. Ltd., Rangoon. **CANADA:** Hackbridge and Hewittic Electric Co. of Canada Ltd., Montreal; The Northern Electric Co. Ltd., Montreal, etc. **CEYLON:** Envee Eva Ltd., Colombo. **CHILE:** Sociedad Importadora del Pacifico Ltda., Santiago. **EAST AFRICA:** G. A. Neumann Ltd., Nairobi. **EGYPT:** G.acomo Cohenca Fils, S.A.E., Cairo. **FINLAND:** Sähkö-'a Konellike O.Y. Hermes, Helsinki. **GHANA, NIGERIA & SIERRA LEONE:** Glyndova Ltc.. **GREECE:** Charilaos C. Corcneos, Athens. **INDIA:** Steam & Mining Equipment (India) Private Ltd., Calcutta; Easun Engineering Co. Ltd., Madras, 1. **IRAQ:** J. P. Bahoshy Bros., Baghdad. **MALAYA, SINGAPORE & BORNEO:** Harper, Gilfillan & Co. Ltd., Kuala Lumpur. **NETHERLANDS:** J. Kater, E.O., Ouderkerk a.d. Amstel. **NEW ZEALAND:** Richardson, McCabe & Co. Ltd., Wellington, etc. **PAKISTAN:** The Karachi Radio Co., Karachi, 3. **SOUTH AFRICA:** Arthur Trevor Williams (Pty.) Ltd., Johannesburg, etc. **CENTRAL AFRICAN FEDERATION:** Arthur Trevor Williams (Pty.) Ltd., Salisbury. **THAILAND:** Vichien Phanich Co. Ltd., Bangkok. **TRINIDAD & TOBAGO:** Thomas Peake & Co., Port of Spain. **TURKEY:** Dr. H. Salim Oker, Ankara. **U.S.A.:** Hackbridge and Hewittic Electric Co. Ltd., P.O. Box 234, Pittsburgh 30, Pennsylvania. **VENEZUELA:** Oficina de Ingenieria Sociedad Anonima, Caracas.



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SW/77

CLASSIFIED ADVERTISEMENTS

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URBAN DISTRICT COUNCIL OF COULSDON AND PURLEY

New Group Sodium Lighting in

(a) HIGH ST, PURLEY
(b) GODSTONE RD (PART OF), PURLEY AND KENLEY
(c) MARLPIT LA, COULSDON
(d) SMITHAMBOTTOM LA, PURLEY
(e) WOODCOTE GROVE RD, COULSDON
(f) WOODCOTE RD, PURLEY

TENDERS are invited for the provision and erection of 215 Stanton concrete lighting columns and the provision and fixing of 140 watt sodium lamps and G.E.C. lanterns on the above roads, and the removal of the existing street lighting equipment.

Specification, Bills of Quantities, and Forms of Tender, prepared by H. M. Collins, Engineer and Surveyor, may be obtained upon receipt of a deposit of £4 4s, which will be refunded upon receipt of a bona fide Tender and the return of documents supplied.

Plans and conditions of contract may be inspected at the office of the Engineer and Surveyor.

Sealed Tenders in the envelope provided to be submitted by not later than first post on 24 May, 1960.

The Council do not bind themselves to accept the lowest or any Tender.

ERIC F. J. FELIX,
Clerk of the Council.
Council Offices, Purley, Surrey. (P 758)

BOROUGH OF EALING

STREET LIGHTING, MADELEY ROAD AND QUEENS DRIVE

CONTRACT "A"

SUPPLY of 41—140 watt Sodium Lanterns, complete with gear and lamps.

CONTRACT "B"

Supply and erection of 41—25 ft mounting height steel columns.

Details obtainable from the Borough Engineer, Town Hall, Ealing, W.5, on payment of £5 for each tender, returnable on receipt of a bona fide tender.

Tenders to the Town Clerk, Town Hall, Ealing, W.5, by noon, 31 May, 1960. (P 797)

APPOINTMENTS VACANT

LONDON COUNTY COUNCIL

SOUTH EAST LONDON TECHNICAL COLLEGE
LEWISHAM WAY, LONDON S.E.4

REQUIRED September: (i) LECTURER and (ii) ASSISTANT GRADE B in Electrical Engineering. Salary scales (men): Lecturer, £1,370 x £35—£1,550. Possible entry above minimum if justified by experience and present position; Grade B, within the range, £700 x £27 10s—£1,435. Starting point according to experience, etc., maximum according to training and qualifications. London allowance (both posts) £38 or £51.

Application forms from Secretary at College returnable within two weeks of advertisement date. (1112) (P 784)

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern and Yorkshire Region

TECHNICAL DEPARTMENT
YORKSHIRE DIVISION

APPLICATIONS are invited for the following appointments in the Technical Department, Leeds.

FOURTH ASSISTANT ENGINEER (PROTECTION)

Applicants should possess technical qualifications leading to corporate membership of the I.E.E. and have experience in the application or maintenance of control and protective equipments applied to high voltage transmission and generating systems.

FOURTH ASSISTANT ENGINEER (METERS)

Applicants should possess technical qualifications leading to corporate membership of the I.E.E. and have experience in the assembling and testing of electrical meters and instruments, preferably with summation equipment.

The salary for these appointments will be in accordance with the National Joint Board Agreement, Schedule B, Grade 8, (£735/£800 per annum).

GENERAL ASSISTANT ENGINEERS

Applicants should possess or be completing technical qualifications leading to corporate membership of the I.E.E. and have some knowledge of control and protective equipment applied to high voltage transmission and generating systems.

The salary for these appointments will be in accordance with the National Joint Board Agreement, Schedule B, Grade 9, (£570/£725 per annum).

Forms of application may be obtained from the Assistant Regional Secretary (Personnel), Central Electricity Generating Board, North Eastern and Yorkshire Region, 1 Whitehall Rd, Leeds 1, to whom they should be returned to arrive not later than the 21 May, 1960. (P 780)

THE NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments:

1. Area Board Headquarters

(a) ONE SENIOR ASSISTANT

Secretary's Department, Estates and Wayleaves Section with location at Carliol Hse, Newcastle upon Tyne. Duties will include acquisition of substation sites, Service Centres and other non-operation property.

Applicants should have experience of urban estate work and be members of either the Royal Institution of Chartered Surveyors or Chartered Auctioneers' and Estate Agents' Institute.

Salary: N.J.C. Grade 6 or 7, £980/£1,160 according to qualifications and experience. N.J.C. Conditions of Service.

2. Wear Sub-Area

(a) ONE SECOND ASSISTANT DISTRICT ENGINEER

South Shields District. Applicants should have had a sound training and experience in the construction, operation and maintenance of H.V. and L.V. underground distribution networks, substation plant and auxiliary equipment. Knowledge of overhead line maintenance an advantage. Preference will be given to candidates with qualifications

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leading to Corporate Membership of I.E.E. Successful applicant will be required to reside in the District and undertake standby duties.

Salary: N.J.B. Class F, Grade7, £910/£955. N.J.B. Conditions of Service.

(b) ONE FOURTH ASSISTANT ENGINEER

Planning and Development Section with location at Sub-Area Headquarters, Sunderland.

Applicants must have had training and experience of the planning and design of underground and overhead H.V. and L.V. distribution systems and have the Higher National Certificate in Electrical Engineering or an equivalent qualification.

Salary: N.J.B. Class L, Grade 13, £860/£905. N.J.B. Conditions of Service.

3. Tees Sub-Area

(a) ONE FOURTH ASSISTANT ENGINEER

(Assistant Clerk of Works—Buildings) with location at Sub-Area Headquarters, Thornaby on Tees.

Duties include supervision of the construction and maintenance of the Board's property comprising substations, workshops, depots, Service Centres and offices. Applicants should be familiar with Bills of Quantities and able to set out, measure up, and deal with interim and final accounts.

Salary: N.J.B. Class L, Grade 13, £860/£905. N.J.B. Conditions of Service.

(b) TWO THIRD ASSISTANT ENGINEERS

Planning and Development Section with location at Sub-Area Headquarters, Thornaby on Tees.

Applicants should have had a sound training and experience in H.V. and L.V. overhead and underground distribution. Duties will include load and voltage calculations, to assist in planning of new distribution networks and the preparation of system reinforcement schemes. Preference will be given to candidates with qualifications leading to Corporate Membership of I.E.E.

Salary: N.J.B. Class L, Grade 10, £1,025/£1,085. N.J.B. Conditions of Service.

Applications stating age, qualifications and experience to be received by Assistant Secretary (Establishments), The North Eastern Electricity Board, G.P.O. Box No. 117, Carliol Hse, Newcastle upon Tyne, within ten days of the appearance of the advertisement. (P 776)

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Division

LITTLEBROOK POWER STATION
Vacancy No. 99/60.

ASSISTANT SHIFT CHARGE ENGINEER

EXPERIENCE in operation of modern power station plant necessary and possession of H.N.C. preferred. Some experience of oil-fired boilers would be an advantage.

Salary: N.J.B. Class L, Grade 8, £1,364 10s/£1,447 per annum, including London Allowance and shift allowance.

Vacancy No. 100/60.

ASSISTANT ENGINEER (MECHANICAL MAINTENANCE)

Applicants should have had a wide practical experience in modern power station and boiler house maintenance on both coal and oil-fired boilers, and should possess H.N.C. or equivalent qualifications. A knowledge of the Civil Works associated with power stations would be an advantage.

Salary: N.J.B. Class L, Grade 11, £1,015/£1,075 per annum, including London Allowance.

Applications giving age, details of experience, present position, etc., should be sent to the Station Superintendent, Littlebrook Power Station, Nr. Dartford, Kent, to arrive by 24 May, 1960.

W. H. DUNKLEY,
Divisional Controller.
(P 779)

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 40s. per inch, and all other classified advertisements at 3s. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

INSTALLATION INSPECTION ENGINEER

REQUIRED in the Liverpool South district. Salary will be £910/£955 per annum (N.J.B. H/9).

Applicants should have had considerable experience in the testing and inspection of all types of domestic, commercial and industrial installations, and have knowledge of the regulations covering these installations. Experience in the installing and connecting of single-phase and polyphase metering equipment is required. Candidates should possess suitable technical qualifications.

Appointment subject to medical examination. Pension scheme.

Application forms available from the Manager, No. 1 Sub-Area, 24 Hatton Gdn, Liverpool 3, should be completed and returned not later than 17 May, 1960.

(P 763)

CENTRAL ELECTRICITY GENERATING BOARD

East Midlands Division

APPLICATIONS are invited for the following positions within the Division:

ASSISTANT SHIFT CHARGE ENGINEER
WILLINGTON "A" POWER STATION
Vacancy No. 94/60.

Applicants should have received a sound technical training and have had experience in a modern power station.

Preference will be given to candidates who possess the Higher National Certificate, or its equivalent.

Salary will be in accordance with Class L, Grade 8 (£1,195/£1,270 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 13 May, 1960.

ASSISTANT SHIFT CHARGE ENGINEER
BURTON-ON-TRENT POWER STATION
Vacancy No. 95/60.

Applicants should possess H.N.C. or equivalent qualifications and have experience in power station operation.

Salary will be in accordance with Class E, Grade 9 (£765/£810 per annum), of the National Joint Board Agreement, plus £90 per annum shift allowance.

Closing date for receipt of applications: 13 May, 1960.

SENIOR DRAUGHTSMAN
(CIVIL ENGINEERING AND BUILDING)
TRANSMISSION DEPARTMENT
DIVISIONAL HEADQUARTERS
Vacancy No. 96/60.

Applicants for this appointment should have suitable technical training and be thoroughly conversant with the design and detailing for civil and building works, including steel and R.C. structures and foundations. The work is associated with H.V. Substations and Generating Stations.

Salary will be in accordance with Grade 4 of Schedule D of the National Joint Board Agreement and will be within the range £930/£1,030 per annum.

Closing date for receipt of applications: 13 May, 1960.

FOURTH ASSISTANT ENGINEER
TRANSMISSION DEPARTMENT
DIVISIONAL HEADQUARTERS
Vacancy No. 99/60.

Experience in maintenance and operation of 132 kV Transmission Lines and Substations essential.

Candidates should preferably have qualifications leading to Corporate Membership of the Institution of Electrical Engineers.

The salary will be in accordance with Class AX/EX, Grade 7 (£840/£1,065 per annum) of Schedule B of the National Joint Board Agreement.

Closing date for receipt of applications: 20 May, 1960.

ASSISTANT RESIDENT ENGINEER
TRANSMISSION DEPARTMENT
DIVISIONAL HEADQUARTERS
Vacancy No. 102/60.

Applications are invited for the post of Assistant Resident Engineer for Headquarters Schemes within the Division.

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Candidates should have had experience in all phases of construction of transmission lines having steel towers and S.C.A. conductors, and have a knowledge of their design. They should preferably possess H.N.C. Electrical or Mechanical qualifications.

The salary will be in accordance with Class AX/EX, Grade 6 (£925/£1,170 per annum) of Schedule B of the National Joint Board Agreement.

Closing date for receipt of applications: 20 May, 1960.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT which may be obtained from the Divisional Establishments Officer, Central Electricity Generating Board, East Midlands Division, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated.

O. S. WOODS,
Divisional Controller.
(P 759)

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for a superannuable position as a SENIOR ASSISTANT ENGINEER in the Generation/Operation-Test Section of the Chief Engineer's Department at Board Headquarters.

Duties include the routine and acceptance testing of turbo-generator boilers and other station plant, together with the non-destructive testing of materials and component parts.

Applicants should preferably be of degree standard and/or possess corporate membership of the Institution of Electrical Engineers or the Institution of Mechanical Engineers. Previous experience in the organisation of power plant testing is very desirable.

Salary: N.J.B. Class AX/DX, Grade 2, £1,475/£1,705 per annum.

Applications should be submitted on the standard form which may be obtained from the Secretary, South of Scotland Electricity Board, Inverlair Ave, Glasgow S.4, and returned, quoting reference E17/60, not later than 21 May, 1960. (P 762)

BOROUGH POLYTECHNIC

Borough Road, London, S.E.1

PRINCIPAL: JAMES E. GARSIDE,
M.SC.TECH., PH.D., F.R.I.C., F.I.M., F.INST.P.

THE Governors invite applications for the following appointments:

Department of Electrical Engineering and Physics

Head of Department: V. Pereira-Mendoza, M.SC.TECH., M.I.E.E.

LECTURER IN ELECTRICAL ENGINEERING

Applicants should be University Graduates in Electrical Engineering and have had industrial, research and/or teaching experience. Specialised knowledge in Heavy Electrical Engineering (preferably, but not essentially, in Power Supply) is desired. Courses in Department include Dip.Tech., Part III I.E.E. and H.N.C.

ASSISTANT LECTURER (GRADE B) IN ELECTRICAL ENGINEERING

Applicants should be University Graduates or Graduate Members of the Institution of Electrical Engineers, preferably with teaching and/or industrial experience in this subject.

Salary (Men)

Lecturers: Within the range £1,408/£1,601 per annum. Assistant Lecturers (Grade B): Within the range of £738/£1,486 per annum.

The point of entry on both salary scales and the maximum depending on age, qualifications, training and experience.

Further particulars and application form, which should be returned as soon as possible, obtainable from the undersigned.

FREDK. J. PACKER,
Clerk to the Governing Body.
(P 756)

NOTTINGHAM AND DISTRICT TECHNICAL COLLEGE

Burton Street, Nottingham

PRINCIPAL: D. A. R. CLARK,
M.SC.(TECH.), M.I.MECH.E.

APPLICATIONS are invited from suitably qualified persons for the following posts. Previous teaching experience, although not essential, is desirable.

LECTURER IN ELECTRICAL ENGINEERING

to specialise in Utilisation of Electrical Plant and Machines.

ASSISTANT LECTURER, GRADE B, IN ELECTRICAL ENGINEERING

Salaries in accordance with the Burnham Technical Scale as follows:

Lecturer: £1,370 x £35—£1,550 per annum.

Assistant Grade B: £700 x £27 10s—£1,150 per annum plus additions for qualifications and training. Commencing salary according to previous experience.

Facilities and equipment available and time allowed for approved research work.

Further particulars and form of application may be obtained from the Principal, to whom completed forms should be returned not later than 20 May, 1960.

(P 766)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

Board Headquarters

SENIOR ASSISTANT
(PURCHASING DEPARTMENT)

Applicants should have experience of the purchase and stock control of electrical appliances and contracting materials. Salary: £795/£870 per annum, N.J.C., Grade 4. Apply, by letter, within 14 days, stating age, experience, present salary and position to the Secretary, Midlands Electricity Board, Mucklow Hill, Halesowen.

North Staffs Sub-Area

GENERAL ASSISTANT ENGINEER
(PLANNING)
(HEADQUARTERS)

Applicants should have had general distribution experience, and duties will include detailed design of major substations, specifications for substation equipment, planning and estimating for system extensions. Technical qualifications desirable. Salary: £815/£860 per annum (N.J.B., Grade L.14). Apply, by letter, within 14 days, stating age, qualifications, experience, present salary and position to Mr C. C. Pimble, Sub-Area Manager, Midlands Electricity Board, 234 Victoria Rd, Fenton, Stoke-on-Trent.

Shropshire and Herefordshire Sub-Area

FIRST ASSISTANT DISTRICT ENGINEER
(SHREWSBURY)

Applicants should have sound technical training and practical experience in the operation and maintenance of L.V. and H.V. systems up to 33 kV. Technical qualifications desirable. The successful applicant will be required to undertake standby duties. Salary: £965/£1,025 per annum (N.J.B. Grade E.5).

THIRD ASSISTANT DISTRICT ENGINEER
(LUDLOW)

Duties include the construction, maintenance and operation of H.V. and L.V. mains and substations, and applicants should have had experience in the planning of system reinforcements and mains extensions. Technical qualifications desirable. Salary: £765/£810 per annum (N.J.B. Grade E.9).

Apply, by letter, within 14 days, stating age, qualifications, experience, present position and salary to Mr W. Winwood, Sub-Area Manager, Midlands Electricity Board, Spring Gdns, Ditherington, Shrewsbury.

F. W. CATER,
Secretary.
(P 765)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

SOUTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD

PRINCIPAL ASSISTANT ENGINEERS II
(HEATING AND VENTILATING) AND
(ELECTRICAL)

APPLICATIONS are invited for the above appointments on the permanent staff of the Board's Regional Engineer generally in accordance with Whitley Council conditions of service.

The Board is undertaking a considerable programme of hospital development and the persons appointed will be engaged on varied and interesting work.

The commencing salary (on or after 1 July, 1960) will be at the minimum of the scale £1,665 x £50(1) x £75(2) x £85(2)—£2,035 plus London Weighting allowance of £50 p.a. Applicants must be Corporate Members of the Institution of Mechanical or Electrical Engineers and should be experienced in the preparation of specifications, drawings and estimates for large engineering installations in hospitals and large public buildings.

Applications stating age, qualifications, experience, present appointment and salary, together with the names and addresses of three referees, should be sent to the undersigned at 40 Eastbourne Ter, London W.2, by not later than 16 May.

E. G. BRAITHWAITE,
Secretary.
(P 767)

THE EAST MIDLANDS ELECTRICITY BOARD

Staff Vacancies

APPLICATIONS are invited from suitably qualified and experienced persons for the following appointments. Applications should state age, qualifications, present position and salary, previous experience and quote the appropriate Vacancy Number.

Northamptonshire Sub-Area

Vacancy No. 44/60.

THIRD ASSISTANT DISTRICT ENGINEER
KETTERING DISTRICT

Salary: N.J.B. Class G, Grade 9, £860 x £15—£905 per annum.

Candidates should have had practical experience of the operation and maintenance of Urban and Rural distribution systems.

A technical qualification equivalent to the Higher National Certificate in Electrical Engineering would be an advantage.

The successful candidate will be required to undertake standby duty and to reside in or near Corby, Northants.

Vacancy No. 46/60.

FOURTH ASSISTANT ENGINEER
(SHIFT OPERATION)
SUB-AREA HEADQUARTERS

Salary: N.J.B. Class K, Grade 12, £860 x £15—£905 per annum plus shift allowance.

Candidates should have had experience of switching operations on a High Voltage distribution system, preferably including both Urban and Rural networks. Experience in the issue and cancellation of Permits to Work under the C.E. Safety Rules, or acting as Control Engineer for part of a High Voltage system, would be an advantage.

Vacancy No. 47/60.

THIRD ASSISTANT DISTRICT COMMERCIAL ENGINEER
DAVENTRY DISTRICT

Salary: N.J.B. Class E, Grade 9, £765 x £15—£810 per annum.

The duties will include the preparation of specifications and estimates for electrical installations, progressing of contracting work and advice to consumers on domestic wiring installations and apparatus.

Applicants should be familiar with the Board's tariffs and should have had previous commercial experience in electrical contracting work, the maintenance and design of domestic electrical appliances, and consumer service. The possession of a suitable technical qualification would be an advantage.

Applications for the above vacancies should be addressed to The Manager,

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Northamptonshire Sub-Area, 25 Bridge St, Northampton, within 14 days of the date of this advertisement.

Nottingham Sub-Area

Vacancy No. 45/60.

WAYLEAVE OFFICER

Salary: N.J.C. Grade 3, £720 x £20—£780 per annum.

The duties will include the acquisition of substation sites and other properties, negotiation of wayleaves for underground cables and overhead lines, settlement of compensation claims including damage to crops, etc.

The ability to drive a motor vehicle and the possession of a current driving licence would be an advantage.

Applications should be addressed to The Manager, Nottingham Sub-Area, 35/39 Carrington St, Nottingham, within 14 days of the date of this advertisement. (P 769)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

APPLICATIONS are invited for a SENIOR COMMERCIAL ASSISTANT (CONSUMERS' ADVISER) at Perth. Candidates should possess wide experience in commercial matters, particularly in regard to dealing with Local Authorities and with consumers' problems on tariffs, connection terms, and conditions of supply. A good knowledge of the Electricity Supply Industry is essential.

Salary commencing at a point within the range £885/£1,055 (N.J.C. Grade 5/6), depending on experience and qualifications. Superannuation Scheme.

Application forms, obtainable from the Area Manager, Blackfriars, Perth, should be returned by 18 May, 1960. (P 772)

COUNTY COUNCIL OF THE WEST RIDING OF YORKSHIRE

ASSISTANT ELECTRICAL ENGINEER

REQUIRED for the County Architect's Office at Wakefield. Salary range: Special Grade: £785/£1,070; or Apt. III: £880/£1,065.

Applicants should possess the Higher National Certificate in Electrical Engineering, have served a recognised apprenticeship with a reputable firm and be capable draughtsmen with good experience in the preparation of schemes, specifications and estimates for all classes of electrical installation work.

Applications stating age, qualifications, experience, present position and giving names and addresses of three referees, to be sent to the undersigned not later than Tuesday, 17 May, 1960.

A. W. GLOVER, F.R.I.B.A.,
County Architect.

Bishopgarth,
Westfield Rd,
Wakefield. (P 755)

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

Revised Advertisement

Vacancy No. 105/ET/60.

APPLICATIONS invited for superannuable N.J.B. appointment of DRAUGHTSMAN in the CONSTRUCTION UNIT of the GENERATION DEPARTMENT at DIVISIONAL HEADQUARTERS.

Salary: D.3, £1,055/£1,155 per annum, or D.4, £930/£1,030 per annum, according to qualifications and experience.

Applicants should be suitably qualified and have experience in Civil Engineering and Building Works for H.V. Substations, including design and detailing of reinforced concrete foundations, piling, road and drainage schemes.

The work will necessitate visits to sites within the Division for preparation of scheme extensions.

Previous applicants need not re-apply.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned by 20 May, 1960. (P 753)

CENTRAL ELECTRICITY GENERATING BOARD

London Division

APPLICATIONS are invited for the following superannuable post. Conditions of service in accordance with N.J.B. Agreement, Schedule D. Salary includes London allowance.

SENIOR DRAUGHTSMAN (DIAGRAM OR LAYOUT) ELECTRICAL
CONSTRUCTION SECTION
GENERATION DEPARTMENT
DIVISIONAL HEADQUARTERS
GENERATION HOUSE
GREAT PORTLAND STREET, W.1

Vacancy No. 60/298.

Qualifications to O.N.C., H.N.C. or equivalent, according to Grade IV or V with layout experience or preparation of wiring diagrams and schematics for all types of heavy electrical equipment and control gear associated with large modern Generating Stations including lighting and heating. An apprenticeship and/or practical knowledge gained with manufacturing firm would be an advantage. Salary: £830/£1,080 per annum, Grade 4 or 5.

Applications, quoting vacancy number, may be made on the standard form obtainable locally and sent to the Personnel Officer, Central Electricity Generating Board, London Division, P.O. Box 136, London W.1, by 17 May, 1960. (P 761)

LONDON ELECTRICITY BOARD

VACANCY
DISTRICT MANAGER
ESSEX SUBURBAN DISTRICT

THE London Electricity Board invite applications for the appointment of District Manager of their Essex Suburban District.

The District, which supplies about 100,000 consumers (having a maximum demand of the order of 130 MW), within the Local Authorities' areas of Ilford, Chigwell, Wanstead and Woodford and part of Dagenham, is one of the 18 Two-tier Managed Districts into which the Board's Undertaking is divided.

The District Managements are directly responsible to Board Headquarters.

The salary will be in accordance with Class D, Grade 7, of the N.J.M. and H.E. Grades Agreement (£2,620/£2,820 per annum, including London Allowance).

Applications, stating age, qualifications, experience, present position and salary, must reach the Secretary of the Board at 46 New Broad St, London E.C.2, by 13 May, 1960. (P 754)

SOUTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD

REGIONAL ENGINEER'S DEPARTMENT

APPLICATIONS are invited for appointments on the permanent staff of the Board generally in accordance with the Whitley Council conditions of service.

The Board is undertaking a considerable programme of hospital development and the persons appointed will be engaged on varied and interesting work.

Engineering General Grade

Applicants should be (i) Corporate Members of the Institution of Electrical Engineers or (ii) have passed the Institution's examination, and be Graduate Members, and be experienced in the preparation of specifications, drawings and estimates for electrical installations in hospitals and large public buildings.

Salary scale on or after 1 July, 1960: £910 x £35(1) x £40(2) x £45(5) x £50(7)—£1,600. Bar at £1,205 for Graduate Members of the Institution. Corporate Members will commence at £1,160 p.a. London Weighting allowance of £40/£50 p.a. payable in addition.

Applications stating age, qualifications, experience, present appointment and salary, together with the names and addresses of three referees, should be sent to the undersigned at 40 Eastbourne Ter, London W.2, by not later than 16 May.

E. G. BRAITHWAITE,
Secretary.
(P 768)

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT DISTRICT ENGINEER

CRAWLEY and Horsham District. Salary within the range £860/£905 under N.J.B. Class F, Grade 8. Applicants should be suitably qualified and have had training and experience in the construction, operation and maintenance of underground and overhead distribution systems up to 11 kV. The successful applicant will be required to reside within the district and undertake standby duties. Subject to certain conditions, housing accommodation may be available at Crawley. Applications, quoting ET and naming two referees, to District Manager, Seeboard, 50/52 The Broadway, Crawley, by 18 May, 1960.

ASSISTANT ENGINEER
(OPERATION AND MAINTENANCE)

Croydon and West Kent Sub-Area. Salary N.J.B. Class K, Grade 10, £1,015 x £20—£1,075 per annum, including London Allowance. Applicants should either be Corporate Members of the Institution of Electrical Engineers or possess equivalent qualifications and should have had experience in the operation and maintenance of distribution systems up to and including 33 kV. Applications, quoting ET and naming two referees on forms from Croydon and West Kent Area Manager, Seeboard, Electric Hse, Wellesley Rd, Croydon, by 18 May, 1960.

ASSISTANT DISTRICT ENGINEER

Weald District. Salary £765 x £15—£810 under N.J.B. Class E, Grade 9. Superannuable. The successful applicant will be required to assist in construction and maintenance of H.V. and L.V. overhead and underground mains and substations. Technical qualifications desirable. Applications quoting ET and naming two referees to District Manager, Seeboard, Fairview, Highgate, Hawkhurst, Kent, by 18 May, 1960.

ASSISTANT DISTRICT ENGINEER

West Kent District. Salary £1,015 x £20—£1,075, including London Allowance under N.J.B. Class G, Grade 7. Superannuable. Applicants, who should be suitably qualified, must have practical training and experience in general distributing work on systems up to 11 kV. Administrative experience and the ability to organise and execute a programme of work an advantage. Applications quoting ET and naming two referees on forms from District Manager, Seeboard, 286 High St, Orpington, Kent, by 18 May, 1960.

ASSISTANT DISTRICT ENGINEER

Hastings District. Salary £815 x £15—£860 under N.J.B. Class F, Grade 9. Preference to applicants with technical qualifications up to Higher National Certificate standards and with practical experience of the operation, maintenance and construction of M.V. and 11 kV underground and overhead systems. The successful candidate will be expected to undertake standby duty and to reside in or near Hastings. Applications quoting ET and naming two referees to District Manager, Seeboard, 12/13 York Bldgs, Hastings, by 18 May, 1960.

ASSISTANT DISTRICT COMMERCIAL ENGINEER
(PUBLIC LIGHTING)

West Kent District. Salary £805 x £15—£850, including London Allowance, under N.J.B. Class G, Grade 11. Superannuable. The successful applicant will be required to supervise the erection and maintenance of street lighting equipment, to prepare street lighting schemes, and negotiate agreements with Lighting Authorities. Applications quoting ET and naming two referees on forms from District Manager, Seeboard, 286 High St, Orpington, Kent, by 18 May, 1960.

SENIOR DEMONSTRATOR

Twickenham and Richmond District. Salary £640 x £20—£700 plus £40 London Weighting per annum under N.J.C. Grade 2. Superannuable. Applicants should have diploma or certificate in domestic science, also E.A.W. certificate. Duties include lecturing, demonstrating, advising consumers, training junior demonstrators and generally assisting in any of the District's show-

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rooms. Applications, quoting ET and naming two referees, to District Manager, Seeboard, 42 York St, Twickenham, Middx, by 18 May, 1960.

DISTRICT SENIOR COMMERCIAL ASSISTANT (SALES)

Woking District. Salary £980 x £25—£1,055 per annum under N.J.C. Grade 6. Superannuable. The successful applicant will be responsible for the co-ordination of showrooms and stocking of major appliances, sales promotion, including the control of outside representatives and demonstrators, the direction of sales campaigns, exhibitions and publicity and other general commercial duties. Applications quoting ET and naming two referees on forms from District Manager, Seeboard, 4 Chobham Rd, Woking, by 23 May, 1960.

ASSISTANT DISTRICT COMMERCIAL ENGINEER

Woking District. Salary £910/£955 per annum under N.J.B. Class F, Grade 7. Superannuable. The successful applicant will be responsible for the contracting and consumers' service department and must have experience in all aspects of electrical installation and service work. Preference to applicants with Higher National Certificate. Applications quoting ET and naming two referees on forms from District Manager, Seeboard, 4 Chobham Rd, Woking, by 23 May, 1960.

ELECTRICAL FITTER

Hastings District. Wages 5s 1¼d per hour for 42-hour five-day week under N.J.I.C. Agreement. The duties of the successful applicant will include the erection, connection and maintenance of switchgear and transformers throughout the District. Applications quoting ET and naming two referees on forms from District Manager, Seeboard, 12/13 York Bldgs, Hastings, by 16 May, 1960.

CARTOGRAPHIC DRAUGHTSMAN

Dorking and Epsom District. Salary £640 x £20—£700 per annum under N.J.C. Grade 2. Superannuable. Applicants should have experience in the preparation of mains record plans, reproduction of Ordnance Survey Maps and general drawing office routine. Applications quoting ET and naming two referees on forms from District Manager, Seeboard, 56 South St, Dorking, by 18 May, 1960.

GEORGE WRAY,
Secretary.
(P 774)

YORKSHIRE ELECTRICITY BOARD

No. 5 (Wakefield) Sub-Area

THIRD ASSISTANT ENGINEER
(DEVELOPMENT)

APPLICANTS must have had training and experience in the design of electric space heating. Experience in industrial process heating will be an advantage.

The duties will include the design of electric space heating installations.

The successful applicant will be required to visit and advise Architects and Industrialists throughout the Sub-Area in the furtherance of electric load development.

Salary: N.J.B. Class L, Grade 10, £1,025 x £20—£1,085 per annum.

DONCASTER DISTRICT
THIRD ASSISTANT DISTRICT ENGINEER

Applicants should have had practical training and experience in the construction, operation and maintenance of H.V. and M.V. overhead and underground distribution networks, substation plant and ancillary equipment.

Candidates should preferably have attained the technical standard of the Higher National Certificate in Electrical Engineering or hold equivalent qualifications.

Candidates must be prepared to reside in the district and undertake standby duties.

Salary: N.J.B. Class G, Grade 9, £860 x £15—£905 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield)

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Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Rd, Wakefield, not later than 20 May, 1960.

No. 6 (Hull) Sub-Area

ASSISTANT INSTALLATION ENGINEER

Applicants must have had a sound technical education and practical experience in electrical contracting work of all types. They must be capable of preparing and supervising schemes for all classes of domestic, commercial and industrial installations, including specifications, estimates and tenders. Applicants must have had experience in the control of workmen.

Preference will be given to applicants who have attained the technical standard of the Higher National Certificate in Electrical Engineering, or equivalent qualifications.

Salary: N.J.B. Class K, Grade 13 £815 x £15—£860 per annum.

Applications, giving full details of age, qualifications and experience together with the names of two referees, should be forwarded to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Kingston upon Hull, not later than 20 May, 1960.

No. 7 (Grimsby) Sub-Area

GRIMSBY, SCUNTHORPE AND GAINSBOROUGH DISTRICTS
THIRD ASSISTANT ENGINEERS
(INSTALLATION)

Applicants should have practical experience in the supervision of the day-to-day work of Installation Inspectors and Electricians engaged on the servicing of consumers' apparatus and installations. An appropriate technical qualification will be an advantage.

Salaries: Grimsby and Scunthorpe Districts, N.J.B. Class G, Grade 10, £815 x £15—£860 per annum. Gainsborough District, N.J.B. Class E, Grade 10, £710 x £15—£755 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Rd, Grimsby, not later than 20 May, 1960.
(P 775)

ELECTRICAL ENGINEERING ASSISTANT

REQUIRED with experience in preparing specifications for H.V. and M.V. plant, including switchgear, transformers, and cabling, and general electrical installations in buildings. For those obtaining H.N.C. (Elec), prospects of advancement in entry grade to a maximum of £1,135 (under review will probably become £1,250). Pensionable. Staff restaurant. One Saturday only worked in five. Form from Chief Engineer (GS/ET/1073/5), L.C.C., County Hall, S.E.1. (P 782)

SOUTH OF SCOTLAND ELECTRICITY BOARD

Clyde Area

THIRD ASSISTANT ENGINEER
(OPERATION AND MAINTENANCE)
AREA HEADQUARTERS

APPLICATIONS are invited for the above appointment.

Applicants should have had a sound engineering training, followed by experience in the planning and maintenance of an H.V. and L.V. industrial and rural underground and overhead system, and should be Corporate Members of the Institution of Electrical Engineers or hold equivalent qualifications.

The conditions of employment will be in accordance with the N.J.B. agreement for the Electricity Supply Industry and the salary on Class K, Grade 10, of that agreement, viz. £965/£1,025 per annum.

Applications on the standard form obtainable from this office should be sent to the undersigned within 14 days of the appearance of this notice.

H. B. BRUCE,
Manager.

P.O. Box 15,
206 St Vincent St,
Glasgow C.2. (P 764)

THE NORTH EASTERN ELECTRICITY BOARD

Area Board Headquarters, Newcastle upon Tyne, 1

VACANCY FOR ASSISTANT CHIEF ACCOUNTANT

APPLICATIONS are invited for the post of Assistant Chief Accountant in the Chief Accountant's Department. The successful applicant will be responsible for the Capital Expenditure records of the Board, Taxation, preparation of financing and other Returns, etc. The possession of a recognised accountancy qualification is essential.

The salary will be in accordance with the N.J.M. Class B, Grade 7 (£2,160/£2,360), and the post is superannuable.

Applications, marked "Confidential," to be received by the Secretary, The North Eastern Electricity Board, Carliol Hse, Newcastle upon Tyne 1, not later than 16 May, 1960.

J. E. HAYES,
Secretary.
(P 743)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Suffolk Sub-Area

APPOINTMENT OF MANAGER

92/60.R.

Following the appointment of Mr P. Sydney as Manager, Chilterns Sub-Area, he is resigning from the post of Manager, Suffolk Sub-Area, and applications are invited from suitably qualified candidates to fill the resultant vacancy.

Salary in accordance with Grade 10, Class C, of the National Joint Managerial Agreement £2,980/£3,205).

Applications to reach The Secretary, Eastern Electricity Board, P.O. Box 40, Wherstead, Ipswich, Suffolk, by 13 May, 1960.

Fens Sub-Area

SUB-AREA HEADQUARTERS

ENGINEERING DRAUGHTSMAN (BUILDING AND CIVIL ENGINEERING)

93/60.R.

Civil Engineering Draughtsman for general steelwork and reinforced concrete structures. Some electrical knowledge would be an advantage. The successful applicant will be a member of a team making up layouts of 33,000-volt outdoor type substations.

Salary: N.J.B. Schedule D, Grade 6 £620/£740).

Apply by letter to the Secretarial Officer, Fens Sub-Area, Eastern Electricity Board, Milton Hall, Milton, Cambridge, by 20 May, 1960.

Norfolk Sub-Area

SUB-AREA HEADQUARTERS, NORWICH

FOURTH ASSISTANT ENGINEER (OPERATION AND MAINTENANCE)

SUB-AREA ENGINEERING DEPARTMENT

94/60.R.

Applications are invited for the post of Fourth Assistant Engineer in the Sub-Area Engineering Department. Applicants should have had a sound technical training and possess the Higher National Certificate or equivalent qualification. The main duties of this post will be concerned with telecommunications.

Salary: N.J.B. Class K, Grade 12 (£860/£905).

Apply by letter to the Engineer, Norfolk Sub-Area, Eastern Electricity Board, 4 Duke St, Norwich, Norfolk, by Friday, 6 May, 1960.

Northmet Sub-Area

SUB-AREA HEADQUARTERS, LONDON N.14

CIVIL ENGINEERING AND BUILDING SECTION

TWO GENERAL ASSISTANT ENGINEERS (REF. 957)

96/60.R.

Candidates should have had a good general and technical education, possess a

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sound knowledge of practical building and civil engineering construction and be capable of setting out and supervising site works.

Salary: N.J.B. Grade 16 £815/£860) plus London Allowance.

TWO ENGINEERING DRAUGHTSMEN (REF. 958)

95/60.R.

Candidates should have had a good technical training and experience in the preparation of plans and detailed drawings of building and civil engineering works including Substations, Service Centres, Workshops and Offices. Possession of the O.N.C. Building) or an equivalent qualification will be an advantage.

Salary: N.J.B. Schedule D, Grade 6 (£620/£740) plus London Allowance.

For these appointments apply by letter to the Manager, Eastern Electricity Board, Northmet Sub-Area, Northmet Hse, Southgate, London N.14, by 16 May, 1960.

TOTTENHAM DISTRICT

THIRD ASSISTANT ENGINEER (REF. 945)

97/60.R.

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations.

Salary: N.J.B. Class F, Grade 9 (£815/£860) plus London Allowance.

Apply by letter to the Manager, Eastern Electricity Board, 312 High Rd, Tottenham, N.15, by 16 May, 1960.

FOURTH ASSISTANT ENGINEERS

(a) NORWICH DISTRICT

98/60.R.

(b) HORNSEY DISTRICT (REF. 950)

99/60.R.

(c) WOOD GREEN DISTRICT (REF. 952)

100/60.R.

Candidates should have had a sound technical training and suitable experience in the construction operation and maintenance of H.V. and L.V. distribution systems including substations.

Salaries: (a) and (b) N.J.B. Class G, Grade 11 (£765/£810); (c) N.J.B. Class F, Grade 11 (£710/£755); plus London Allowance for posts (b) and (c). It is anticipated that posts (a) Norwich District, will be reclassified to Class (H) from 1 April, 1960, in which case the scale would be £815/£860.

For these appointments apply by letter as follows:

(a) The Manager, Norwich District, Eastern Electricity Board, 4 Duke St, Norwich, Norfolk, by 20 May, 1960.

(b) C. Bradley, M.I.E.E., Manager, Eastern Electricity Board, The Broadway, Crouch End, Hornsey, London N.8, by 16 May, 1960.

(c) R. A. Voit, M.I.E.E., Manager, Eastern Electricity Board, 13/27 Station Rd, Wood Green, London N.22, by 16 May, 1960.

(P 777)

THE SOUTH WALES ELECTRICITY BOARD

SUPERVISOR

CENTRAL TYPING SERVICE

A SUPERVISOR is required to take charge of the Central Typing Service at the Mon and Mid-Wales Area Offices, Cwmbran. The Central Typing Service will cover the work of both the Mon and Mid-Wales Area and the East Mon District.

The successful applicant will be responsible for staff supervision, for allocation of work and for supervision of the dictation system, and will be required to assist in the normal work of the Central Typing Service.

The post is a new and responsible one and some experience of supervision of a Typing Service and use of dictating machines would be an advantage. Applicants should be qualified and experienced shorthand typists, capable of assisting with the training of Junior Typing Staff.

The salary for the position will be in

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accordance with Grade 2 (£640/£700) of the National Joint Council (Administrative and Clerical Grades) Agreement for the Electricity Supply Industry.

Applications stating age, present position, present salary, qualifications and experience should be addressed to D. G. Gwyn, B.SC., A.M.I.E.E., Manager, Mon and Mid-Wales Area, Albany Chambers, Skinner St, Newport, Mon, so as to arrive not later than Saturday, 14 May, 1960.

Envelopes should be endorsed "Supervisor-90/60".

SENIOR DEMONSTRATOR AND DEMONSTRATORS

Applications are invited for the following Demonstrator posts:

(a) Senior Demonstrator—Swansea District. Salary N.J.C. Grade 2, £640/£700.

(b) Demonstrator—Neath District. Salary N.J.C. Grade 1, £525/£625.

(c) Demonstrator—Bridgend District. Salary N.J.C. Grade 1, £525/625.

Candidates must be competent to give demonstrations and lectures in public halls, consumers' houses or showrooms on cooking, laundering or housecraft subjects. They should also have sales ability for showroom duties, and a good knowledge of electrical appliances.

The qualifications required are the Diploma of a recognised Domestic Science College, or the Demonstrators' Certificate, and candidates should hold the E.A.W. Certificate.

The person appointed will be required to take part in the agreed rota of Saturday working.

Applications stating age, qualifications, experience and particulars of present duties should be addressed to the undersigned at St. Mellons, Cardiff, so as to arrive not later than Saturday, 21 May, 1960.

Envelopes should be marked (a) "Senior Demonstrator—8/60, (b) Demonstrator—87/60, or (c) Demonstrator—89/60".

R. G. WILLIAMS,
Secretary.
(P 773)

ELECTRICITY DEPT.

Cape Town, South Africa

POWER STATION CHEMIST

A VACANCY exists in the Generation Branch of the Electricity Department of the City Council of Cape Town, South Africa, for a suitably qualified person for the position of Power Station Chemist.

The scale of pay (total emoluments) applicable to the post is £1,560 with two increments of £60 to a maximum of £1,680 per annum.

Applicants must possess a degree in Chemistry of a recognised university or an equivalent qualification. They must have had experience in a power station laboratory and be familiar with the methods of sampling and analysis of materials used in a power station, preferably with advanced steam conditions. A knowledge of nuclear physics and the use of radio-active isotopes will be an advantage.

Persons possessing the requisite qualifications and experience are invited to apply not later than Monday, 23 May, 1960, and to address their applications to:

Messrs Merz and McLellan,
Carliol Hse,
Newcastle upon Tyne,
England,

from whom further particulars relating to the vacant position may be obtained.

(P 752)

SOUTHERN ELECTRICITY BOARD

SENIOR ASSISTANT ENGINEER
(PLANNING AND DEVELOPMENT)
(Z.1202)

SUB-AREA Engineering Department of No. 1 (Southall) Sub-Area, located at Waterloo Rd, Uxbridge. Salary: N.J.B. Class M, Grade 2 (£2,080/£2,200 per annum, inclusive of London Allowance). N.J.B. conditions of service.

Candidates must be able to organise a department carrying out planning of distribution networks up to and including 66 kV and preferably should have had general experience in the Supply Industry, including maintenance and operation.

SECOND ASSISTANT ENGINEER
(MAINTENANCE AND OPERATION)
(Z.1201)

Sub-Area Engineering Department of No. 1 (Southall) Sub-Area, located at Waterloo Rd, Uxbridge. Salary: N.J.B. Class M, Grade 7 (£1,410/£1,500 per annum, inclusive of London Allowance). N.J.B. conditions of service.

The duties of the post will be to assist in the maintenance and operation of switchgear, transformers, cables and overhead lines up to and including 66 kV. The appointment will involve standby duties.

ASSISTANT ENGINEER
(MAINTENANCE AND OPERATION)
(Z.1197)

Heston District of No. 1 (Southall) Sub-Area. Salary: N.J.B. Class G, Grade 9 (£910/£955 per annum, inclusive of London Allowance). N.J.B. conditions of service.

The duties of the post will be to assist with the maintenance and operation of switchgear, transformers, auxiliary gear and underground cables up to and including 11 kV. The appointment will involve standby duties.

ASSISTANT ENGINEER
(MAINTENANCE AND OPERATION)
(Z.1199)

Staines District of No. 1 (Southall) Sub-Area. Salary: N.J.B. Class G, Grade 9 (£910/£955 per annum, inclusive of London Allowance). N.J.B. conditions of service.

The duties of the post will be to assist with the maintenance and operation of switchgear, transformers, auxiliary gear and underground cables up to and including 11 kV. The appointment will involve standby duties.

ASSISTANT ENGINEER
(MAINTENANCE AND OPERATION)
(Z.1200)

Maidenhead District of No. 1 (Southall) Sub-Area. Salary: N.J.B. Class G, Grade 9 (£860/£905 per annum). N.J.B. conditions of service.

The duties of the post will be to assist with the maintenance and operation of switchgear, transformers, auxiliary gear and underground cables up to and including 11 kV. The appointment will involve standby duties.

Applications for the above appointments on forms obtainable from the Sub-Area Secretary, 2/6 Windmill La, Southall, Middx, and returned to him, quoting the appropriate "Z" number, not later than 16 May, 1960.

ASSISTANT ENGINEER
(MAINTENANCE AND OPERATION)

Oxford District of No. 2 (Newbury) Sub-Area. Salary: N.J.B. Class J, Grade 11 (£860/£905 per annum). N.J.B. conditions of service.

The duties of the post will be to assist with the maintenance and operation of H.V. and L.V. distribution mains and substations and with minor construction work. A technical training to H.N.C. standard and experience of similar work are required.

Applications on forms obtainable from the Sub-Area Secretary, 7 Oxford Rd, Newbury, Berks, and returned to him, quoting Z.1192, not later than 16 May, 1960.

ASSISTANT ENGINEER
(MAINTENANCE AND OPERATION)

Swindon District of No. 2 (Newbury) Sub-Area. Salary: N.J.B. Class F, Grade 9 (£815/£860 per annum), with N.J.B. con-

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ditions of service, but present trends indicate that the District may be reclassified to Class G with effect from 1 April, 1960.

The duties of the post will be to assist with the maintenance and operation of H.V. and L.V. distribution mains and substations and with minor construction work. A technical training to H.N.C. standard and experience of similar work are required.

Applications on forms obtainable from the Sub-Area Secretary, 7 Oxford Rd, Newbury, Berks, and returned to him, quoting Z.1024, not later than 16 May, 1960.

ASSISTANT ENGINEER
(MAINTENANCE AND OPERATION)

Staines District of No. 1 (Southall) Sub-Area. Salary: N.J.B. Class G, Grade 12 (£750/£795 per annum, inclusive of London Allowance). N.J.B. conditions of service.

The duties of the post will be to assist with the maintenance and operation of switchgear, transformers, auxiliary gear and underground cables up to and including 11 kV. The appointment will involve standby duties.

Applications on forms obtainable from the Sub-Area Secretary, 2/6 Windmill La, Southall, Middx, and returned to him, quoting Z.1198, not later than 16 May, 1960.

DEMONSTRATOR

Maidenhead District of No. 1 (Southall) Sub-Area. Salary: N.J.C. Grade 1 (£525/£625 per annum). N.J.C. conditions of service.

Applicants should be qualified to advise generally on the utilisation of electric domestic appliances, to give public demonstrations of apparatus and to assist in showroom duties. The possession of an E.A.W. Certificate or equivalent Domestic Science qualification would be an advantage.

Applications on forms obtainable from the Sub-Area Secretary, 2/6 Windmill La, Southall, Middx, and returned to him, quoting Z.1195, not later than 16 May, 1960.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible. (P 778)

LONDON ELECTRICITY BOARD

COMMERCIAL ENGINEER

APPLICATIONS are invited for the above position in the Board's Northern District at Clapton, E.5.

Applicants should have had experience of consumers' service, development, showrooms, tariffs, electrical contracting and maintenance, and the design of space and water heating installations, etc. Corporate membership of the Institution of Electrical Engineers would be an advantage.

The post is graded under Schedule A of the National Joint Board Agreement as Class J, Grade 6, £1,245/£1,320 per annum, inclusive of London Allowance.

Application form obtainable from the Personnel Officer, 46 New Broad St, London E.C.2. Please quote ref.: PER V/2938/T. (P 757)

CENTRAL ELECTRICITY GENERATING BOARD

South Western Division

FOURTH ASSISTANT ENGINEER

REQUIRED in the System Operation Department, at Divisional Headquarters, near Bristol.

Superannuation scheme. Salary, N.J.B., Class AX/EX, Grade 8, £735—£860/£960 per annum.

Applicants should have had a good general and technical education to Higher National Certificate standard with an aptitude for mathematics. Steam generating station experience is desirable. Duties include general and statistical work relating to the operation of the Grid Control Room. Some day/evening shift duties in the Control Room may be required, for which the 10% shift allowance would be paid.

Applications on Form AE6/ACT obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by 14 May, 1960. (P 760)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

SALES SUPERINTENDENT

REQUIRED in the Board's No. 3 Sub-Area, covering Wirral and Chester. Salary within range £1,070/£1,160 per annum (N.J.C. Grade 7).

Candidates should have a good knowledge of electrical appliance trading and sales direction.

Appointments subject to medical examination. Pension scheme.

Forms of application, obtainable from the Manager, No. 3 Sub-Area, Electricity Hse, Newgate St, Chester, should be returned not later than 17 May, 1960. (P 781)

BATHS MAINTENANCE ELECTRICIAN. Forty-four hour week, 5s 9d per hour. Duties include attention to electronic apparatus, instruments and automatic controls, etc. Only thoroughly skilled and experienced men considered. Written application to Town Clerk, Town Hall, Hammersmith, W.6. (P 790)

ELECTRICAL CONTRACTING ESTIMATOR & DESIGNER

Applications are invited for the appointment of an Estimator/Designer by a well-known contracting organisation in Glasgow; extensive experience in estimating large contracts essential. This post offers exceptional opportunities of promotion in rapidly developing Company. Generous salary and superannuation. Apply stating age, apprenticeship, any qualifications and training to Box No. 7843, Electrical Times. (P 750)

CONSULTING ENGINEERS require SENIOR and JUNIOR ELECTRICAL ENGINEERS for the design and supervision of electrical installations in all types of buildings. Good salaries and working conditions available to suitable applicants. Write giving full details to Box ET349, L.P.E., Romano Hse, 399/401 Strand, London W.C.2. (P 742)

WELDING INSPECTING ENGINEER

Applications are invited for the position of Welding Inspecting Engineer.

Candidates should have ample practical experience in shop welding to Class I and II standards and should hold a City and Guilds Certificate of Welding together with Higher National Certificate in Mechanical Engineering or Metallurgy, or equivalent qualifications.

The person appointed will be required to advise on welding procedure and testing and to report upon welding work in progress both in manufacturers' works and in the field: previous experience of similar work would be an advantage.

Salary in accordance with qualifications and experience.

Staff Bonus and Pension Scheme.

Applications giving full details of age, qualifications and experience, within 14 days to:

PREECE, CARDEW AND RIDER,
8, 10 and 12 Queen Anne's Gate,
Westminster, London S.W.1.

(P 751)

ROAN ANTELOPE COPPER MINES LIMITED

NORTHERN RHODESIA

ELECTRICAL ENGINEER

This is a senior appointment and entails full responsibility to the Company's Resident Engineer for all electrical engineering matters.

The Company's activities are extensive, consisting of the mining and milling of approximately six million tons of ore per year and a smelter production of approximately 90 thousand tons of copper per year. The company also operates certain ancillaries including two townships and two hospitals for European and African employees. Power consumption is over 220 million units per year, with a peak load of 34,000 kW and is supplied partly from the Company's own thermal generating station and partly from the Copperbelt 66 kV grid system which is fed from the Kariba Hydro-Electric Scheme.

The initial basic salary although commensurate with qualifications and experience will be in excess of £2,000 per annum. In addition to basic salary there is a cost-of-living allowance currently £6 10s per month. There is also a variable bonus which, at the present time, is 39 per cent of basic salary. The successful candidate will be required to join the Company's Pension and Life Assurance Scheme. Employees contribute 5 per cent of basic earnings, and the Company contributes 5 per cent for the first year increasing its contribution by ½ per cent for each completed year of service. There is also a contributory Medical Benefit Scheme.

Leave at the rate of 55 days per annum may be accumulated over a period of three years. Passage fares to Northern Rhodesia will be paid for the employee and his family.

Accommodation in a large, three-bedroomed house is available on engagement at a sub-economic rental.

Applicants who should have a degree or equivalent qualification in Electrical Engineering, be Corporate members of the Institution of Electrical Engineers, and also have had previous experience in heavy engineering and labour relations should send particulars of age, qualifications and experience, in confidence to:—

D. J. Beake, Selection Trust Building,
Mason's Avenue, Coleman Street, London E.C.2

(P 770)

ELECTRICAL ENGINEER INTERMEDIATE DRAUGHTSMAN with experience in the design of power and lighting installations for modern building projects are offered progressive careers. Five-day week and all mod. cons. Apply in confidence to: Pashler and Partners, Consulting Engineers, 73 Southampton Row, London W.C.1. (P 726)

PYROTENAX LTD. require a well-spoken personable man with electrical wiring experience (preferably including "Pyrotenax"), age 35 or over, for well-paid position as CHIEF DEMONSTRATOR at their London Office. Please apply with fullest details of history to the Sales Manager, Pyrotenax Ltd., Hebburn, Co. Durham. (P 748)

ELECTRICAL ENGINEERS

required by

THE ATOMIC WEAPONS RESEARCH ESTABLISHMENT, ALDERMASTON, BERKSHIRE

To join a group of engineers engaged in the development of new electronic and electro-mechanical devices to meet scientists' requirements. The work covers a wide variety of instrumentation and control, employing the latest constructional techniques.

Applicants should have served a recognised engineering apprenticeship and be Associate or Graduate members of the Institution of Electrical Engineers or have suitable equivalent qualification. Training and study should have covered one or more of the following fields: Telecommunications; electrical measurements; industrial electronics; environmental testing; servo-mechanisms; high voltage techniques or milli-microsecond circuitry.

SALARY: £595 (at age 20)—£860 (age 25)—£1,175 (at age 34 or over)—£1,340.

Superannuation Scheme. A house, or substantial assistance with house purchase, will become available for married officers living beyond daily travelling distance.

For application form please write to the Senior Recruitment Officer, at above address. Please quote ref. 2626/49.

(P 744)

B.B.C. requires ENGINEER in Wiring Unit of Planning and Installation Department in London. The post is temporary for about eighteen months. Applicants should have a Higher National Certificate or equivalent and have served apprenticeship with a well established firm of electrical contractors. Considerable experience in planning, supervision and testing of low and medium pressure electrical installation work desirable. Duties include planning of such work for office premises and studio centres, preparation of estimates and specifications, supervision and testing of work carried out by contractors, and correspondence. Salary appropriate to experience and qualifications within range £935/£1,185. Requests for application forms to Engineering Recruitment Officer, Broadcasting Hse, London W.1, quoting ref: EX.60.17.ET. (P 785)

CHARGE HAND ELECTRICIAN required for Civil Eng. Plant Yard. Maintenance and renovation of electrical plant and installation. Write—Marples, Ridgway and Partners Ltd., Metropolitan Station, Approach Rd, Watford, Herts. (P 783)

TECHNICAL SALES REPRESENTATIVES

We require a number of ambitious young men to undergo a thorough training prior to being appointed to our technical sales force.

Applicants should be under 27 years of age, preferably single, possess H.N.C. and be willing to reside anywhere in the country. Experience of medium voltage electrical switchgear and distribution equipment preferred but not essential. The Company operates a pension fund for its employees.

Full details, in strict confidence, to:

The Sales Director,
DORMAN & SMITH LTD.,
Atherton Works, Blackpool Road,
PRESTON LANCS.

(P 670)

WANTED 677 Trainee Engineers

The Electricity Supply Industry has vacancies this year for 677 recruits to its engineering training schemes. They are required both by the Central Electricity Generating Board and by the 12 Area Electricity Boards.

83 university graduates are needed as graduate trainees. They should possess a degree in electrical or mechanical engineering of a British university.

73 technical college graduates are required as engineering trainees. They should possess a Diploma in Technology, a College Diploma, a Higher National Diploma or a Higher National Certificate in electrical or mechanical engineering.

521 school-leavers are needed as student apprentices. There are two levels of entry: for those who possess a good Ordinary level G.C.E., including passes in maths and science, and for those who have taken G.C.E. at "O" level and have also obtained passes in maths and physics at Advanced level.

Training for university and technical college graduates is by means of a planned two-year course of practical experience, satisfying the requirements of the professional institutions.

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For further information write to:

The Education and Training Officer,
The Electricity Council,
13 Winsley Street,
London, W.1

(P 564)

ELECTRICAL ENGINEER required for Glasgow Office staff, age 23 to 28. Applicants (H.N.C. minimum) should have had experience in the manufacture of electrical machines. Progressive salary with non-contributory pension. Applications stating age, nationality, qualifications and experience to British Engine Boiler and Electrical Insurance Co. Ltd., 98 West George St, Glasgow C.2. (P 787)

ELECTRICAL ENGINEERING ASST., Borough Surveyor's Dept., Fulham Borough Council. Salary within range £630/£1,100. Applicants must have had experience in design and installation of street lighting and good general experience of electrical installations. Five-day week. Canteen. Details and application form from Town Clerk, Town Hall, S.W.6. Closing date 16 May. (P 789)

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Applications are invited for the position of Electrical Engineer in the Corporation's office at Salisbury, Southern Rhodesia.

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Salary will be in accordance with qualifications and experience. Applications in writing should be addressed by Air Mail to:

The Personnel Officer (Salisbury),
P.O. Box 1108,
Salisbury,
Southern Rhodesia,

giving details of academic qualifications and practical experience, together with an indication of the degree of responsibility held.

(P 745)

BRITISH Engine Boiler and Electrical Insurance Co Ltd, Longridge Hse, Manchester 4. ELECTRICAL SURVEYORS required in England and Scotland. Permanent positions carrying progressive salary scale £800/£1,100 and non-contributory pension. Candidates aged 26 to 32, with H.N.C. in Electrical Engineering or Grad. I.E.E. and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply stating age, qualifications and experience. (P 786)

ELECTRICAL TESTING ENGINEER required to take charge of a small test department dealing with electrical power resistors, heaters and other electrical equipment. Some electronic experience would be an advantage though this is not essential. Applicants should have the H.N.C. in Electrical Engineering and should write giving full details of experience, age and salary required to The Expanded Metal Co. Ltd., P.O. Box 14, Stranton Works, West Hartlepool. (P 746)

FOREMAN ELECTRICAL FITTER required. Applicants must have wide experience in Substation construction work and be capable of supervising and controlling men engaged in this type of work. Conditions of service and salary £725 per annum (Schedule E, Grade 2) in accordance with N.J.I.C. Agreement. The successful applicant will be based at Sub-Area Headquarters, Ditherington, Shrewsbury, and must be prepared to work and lodge away from home on occasions. Apply, by letter, stating age, experience and present position to Mr W. Winwood, Sub-Area Manager, Midlands Electricity Board, Spring Gdns, Ditherington, Shrewsbury. (P 788)

LARGE London Electrical Engineering Contractors require SUPERVISING ENGINEER. Must be capable of handling projects from enquiry stage to final completion. Excellent prospects for right man. Permanent, superannuated position. Please write giving full details to Box No. 7827, Electrical Times. (P 704)

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PATENTS

PATENT No. 788222 for "IMPROVEMENTS IN OR RELATING TO ELECTROMAGNETIC INDUCTION APPARATUS FOR FLUORESCENT LAMPS". Owners desire to meet all demands for the utilisation of this Patent and invite inquiries from manufacturers and others in Great Britain prepared to assist in its commercial exploitation. Address Pollak, Mercer and Tench, Audrey Hse, Ely Pl, London E.C.1. (P 793)

THE proprietor of British Patent No. 768061, entitled "IMPROVEMENT IN POWER TRANSMISSION UNITS", offers same for license or otherwise to ensure practical working in Great Britain. Inquiries to Singer, Stern and Carlberg, 140 S. Dearborn St, Chicago 3, Illinois, U.S.A. (P 796)

THE proprietor of British Patent No. 722315, entitled "IMPROVEMENT IN APPARATUS FOR STARTING AND OPERATING GASEOUS DISCHARGE DEVICES", offers same for license or otherwise to ensure practical working in Great Britain.—Inquiries to Singer, Stern and Carlberg, 140 S. Dearborn St, Chicago 3, Illinois, U.S.A. (P 792)

Classified Adverts continued on page 54

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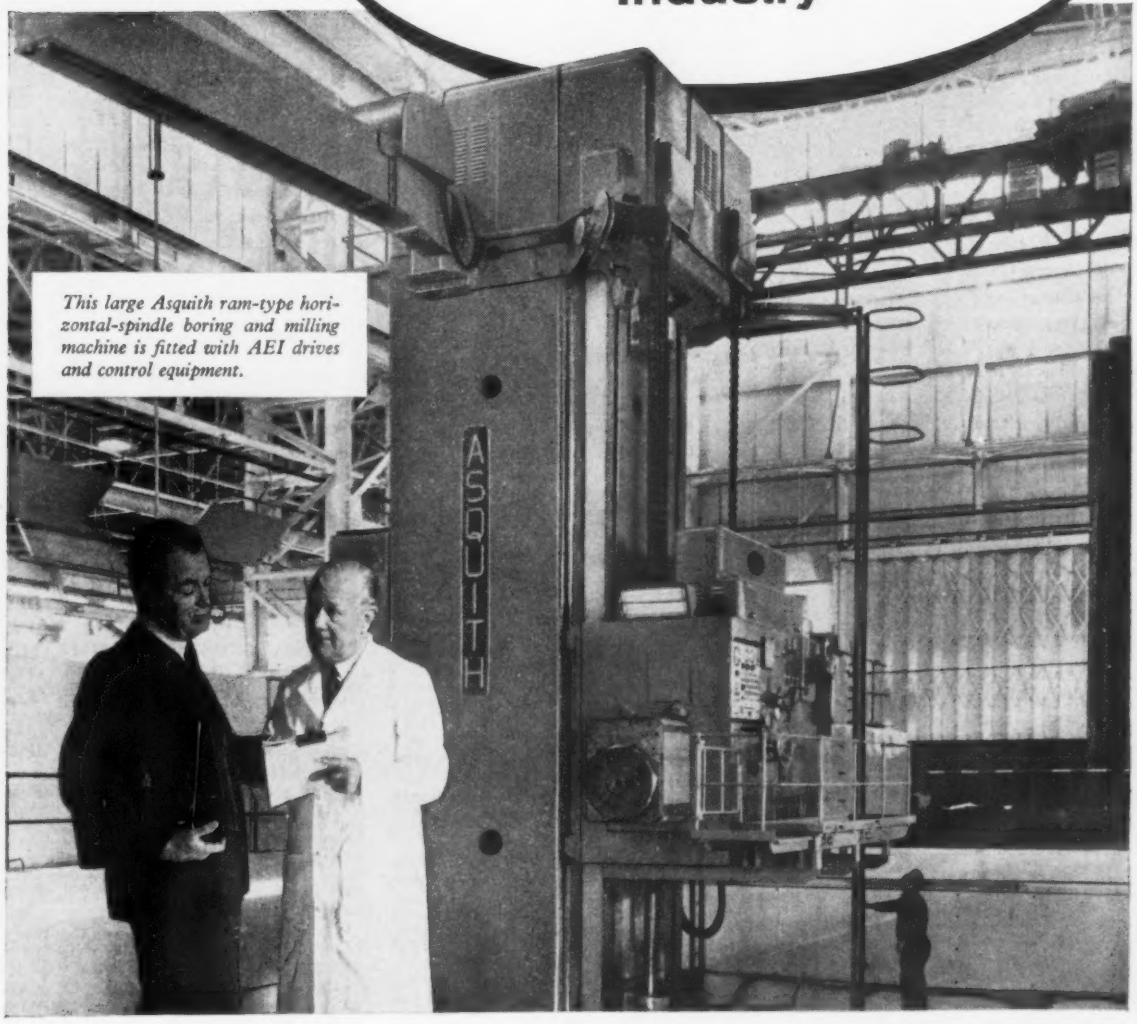

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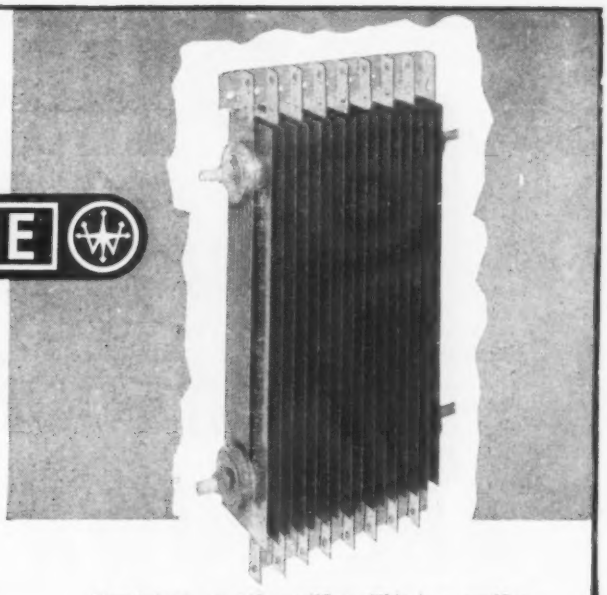

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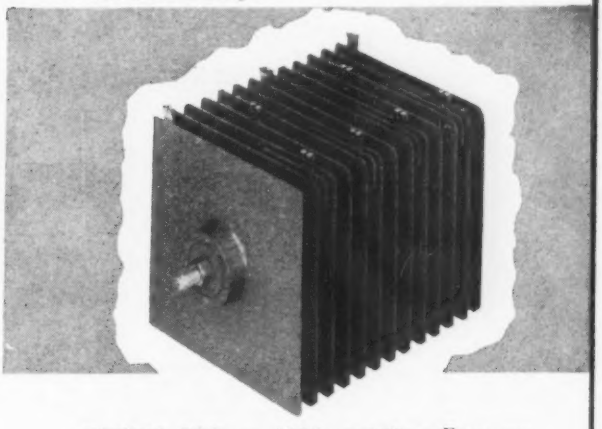

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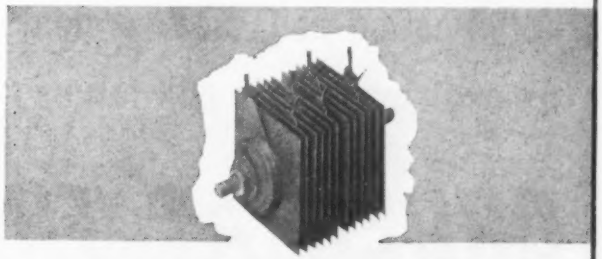

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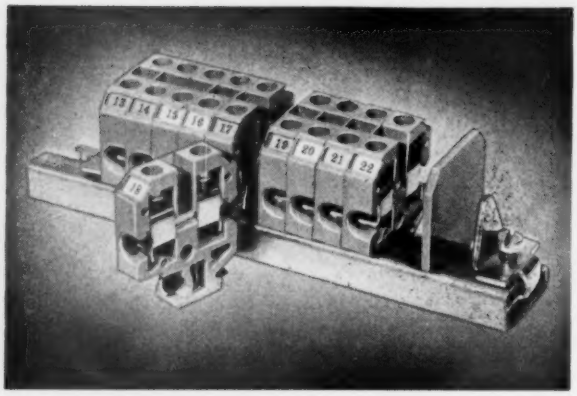

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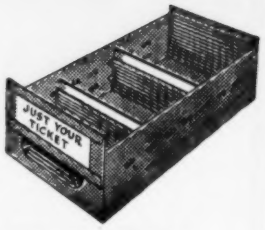

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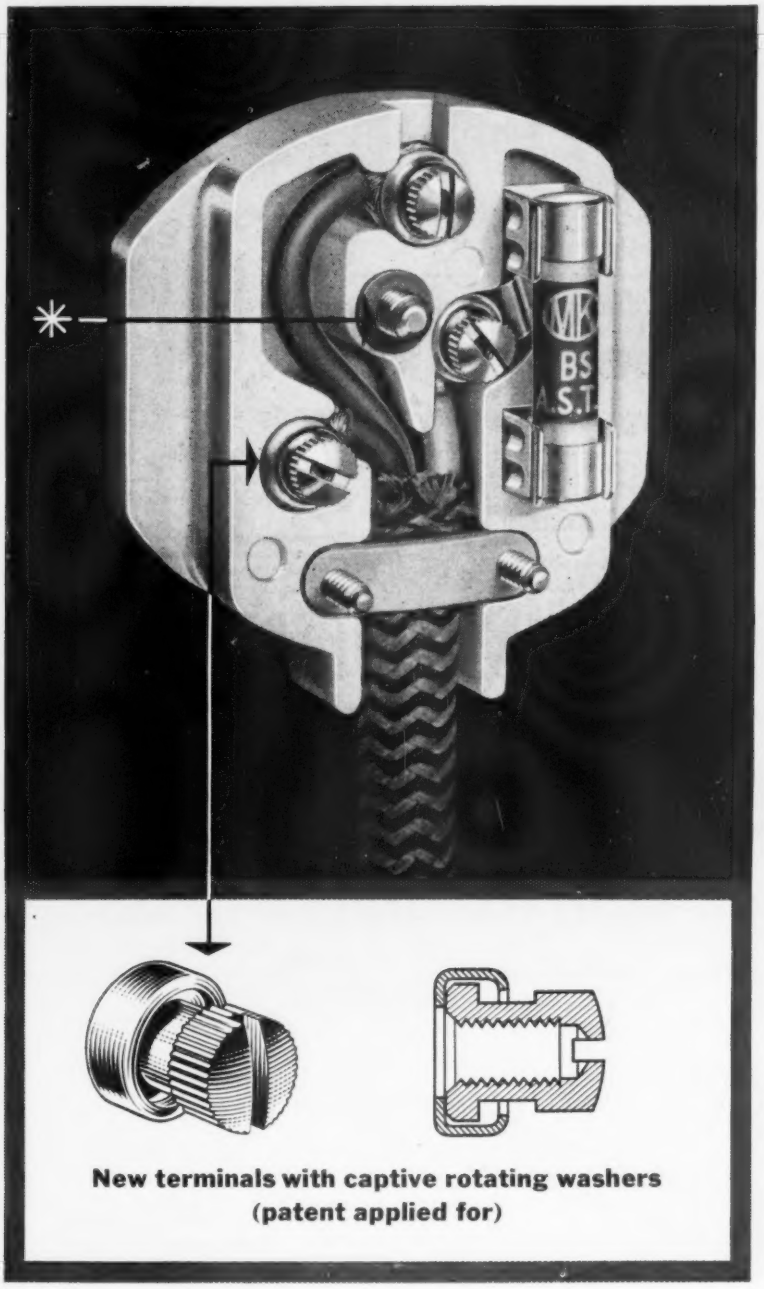

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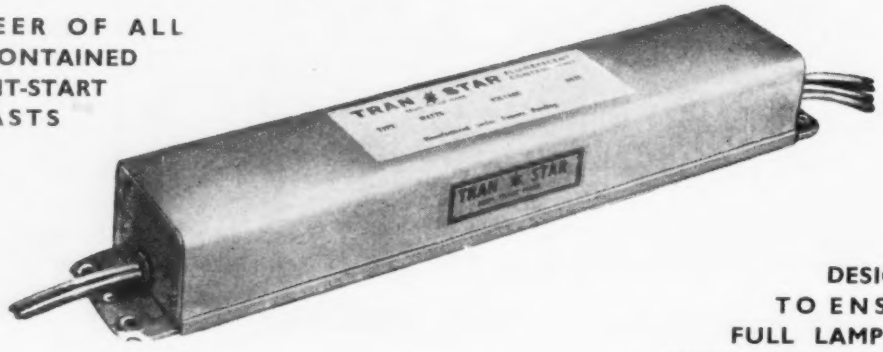

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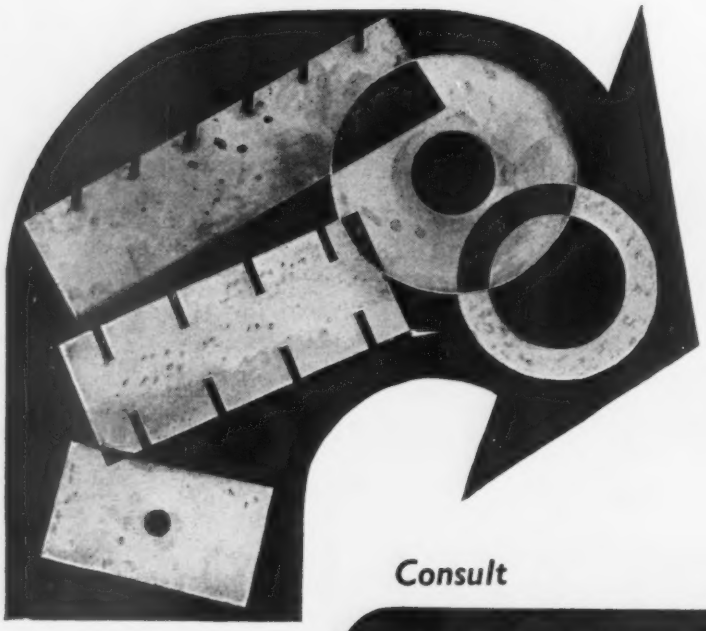

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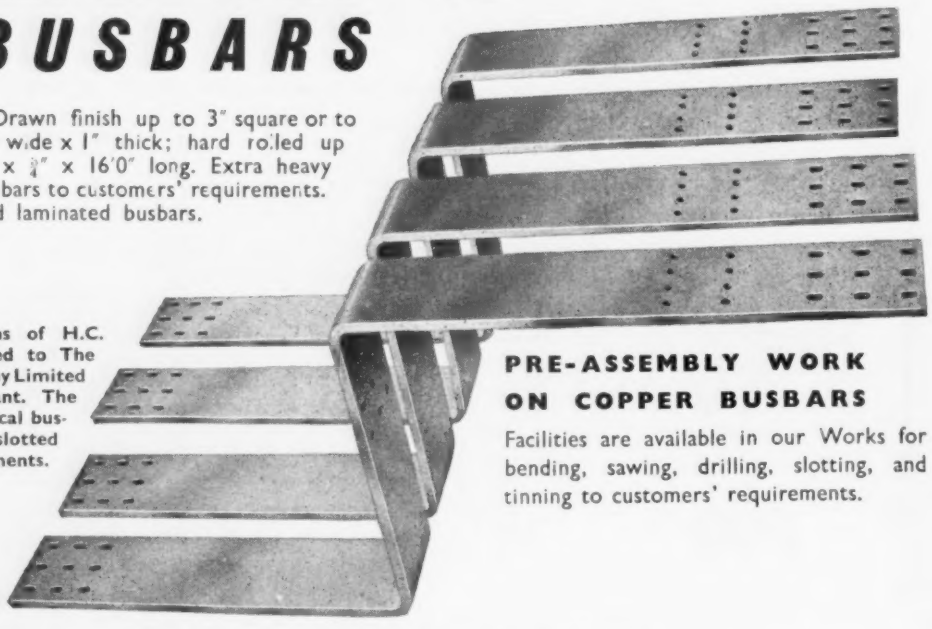

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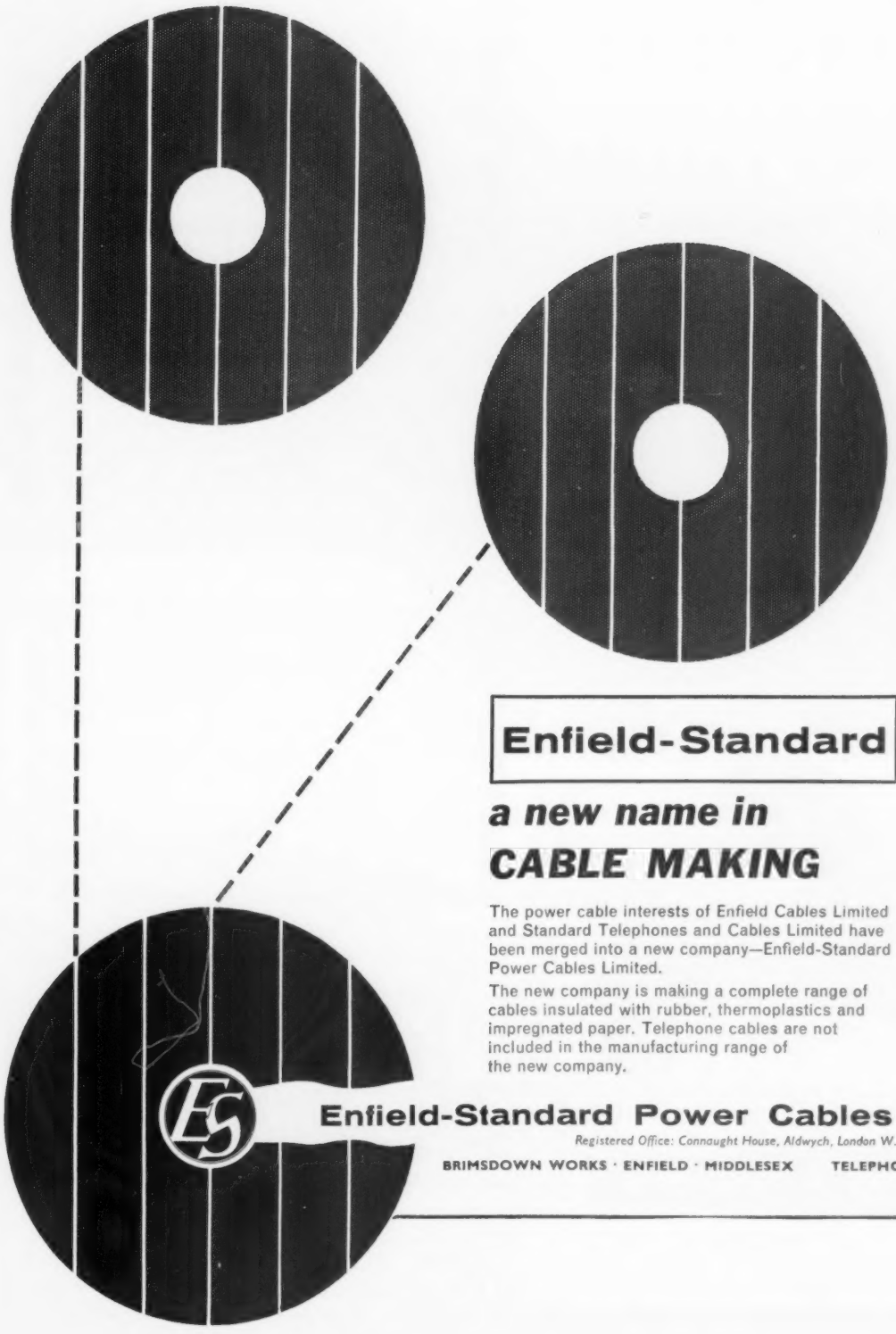

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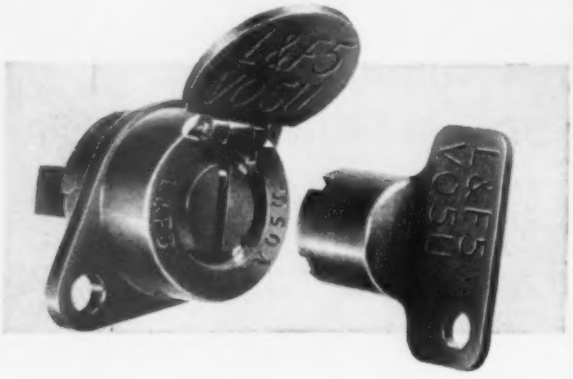

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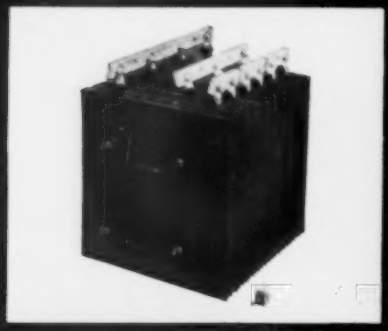

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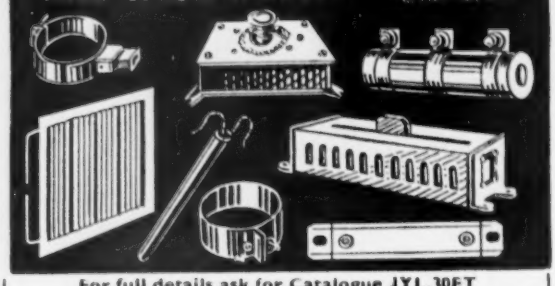

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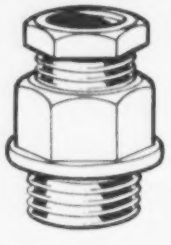

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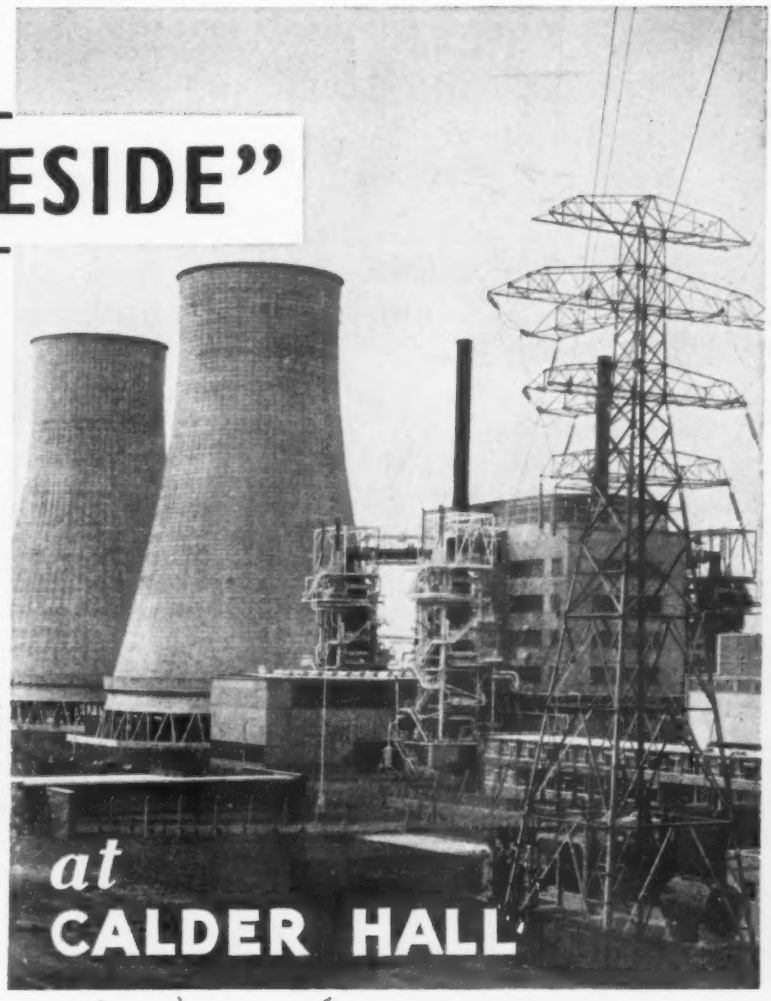

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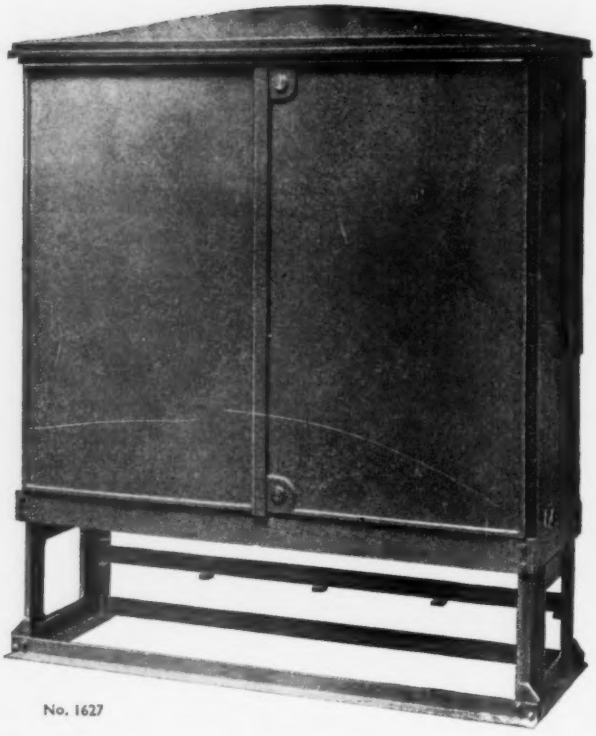

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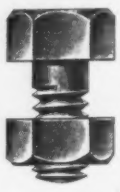

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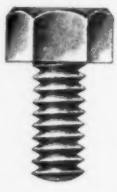

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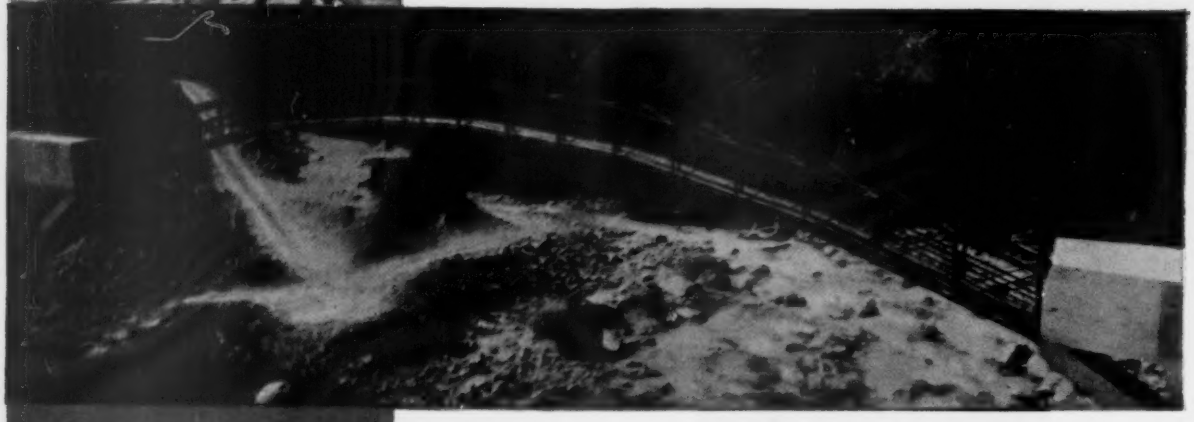

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